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THE

# JOURNAL

OF

# GAS LIGHTING,

111692

# WATER SUPPLY,

Etc.

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VOL. LXXVIII.

JULY TO DECEMBER, 1901.

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LONDON:

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

# THE JOURNAL OF GAS LIGHTING
## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVIII. No. 1990.] LONDON, JULY 2, 1901. [53RD YEAR. PRICE 6d.



**WELDON MUD**
FOR
**GAS PURIFICATION,**
For use in the
**RECOVERY OF SULPHUR,**
ALSO
**Removal of last Traces of SULPHURETTED HYDROGEN in catch position.**

Full Particulars on application to the Patentees:
**GAS DESULPHURIZATION CO.,**
— LIMITED. —
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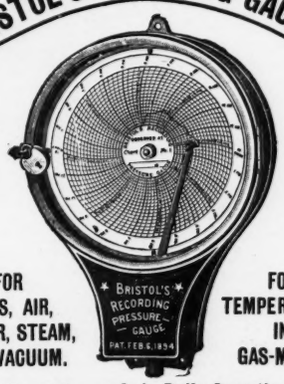
**BRISTOL'S RECORDING GAUGES**

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FOR TEMPERATURE IN GAS-MAINS.
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**Parker's Imperial Black Varnish,**
*Oxide Paints, Oils, and General Stores, for Gas and Water Works.*
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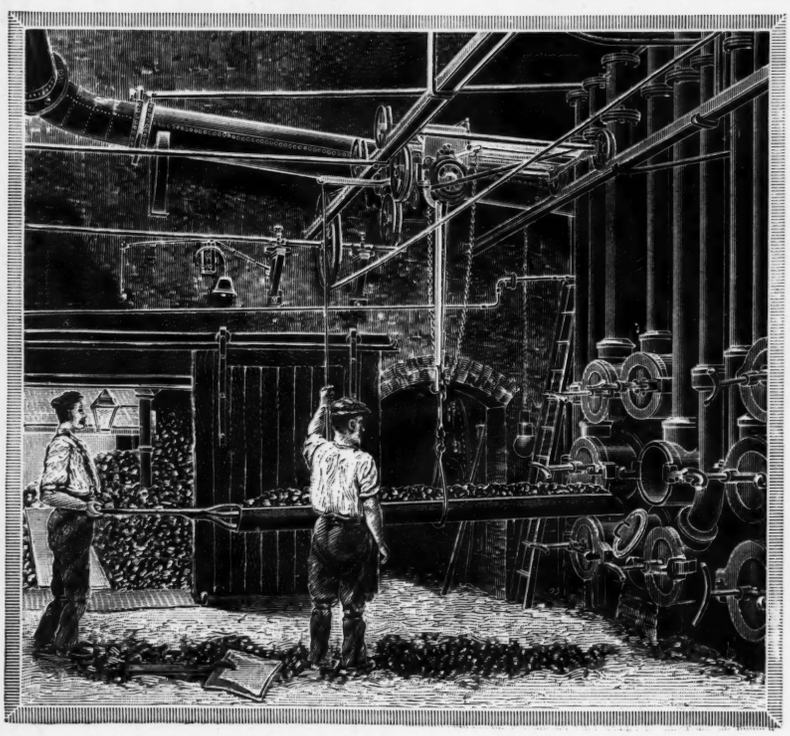
LONDON.

**ROBERT MARSHALL,**
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
*Prices and Analysis of all the Scotch Cannels on Application.*

Wrought-Iron
**TUBES**
And Fittings and Accessories.
**LAMBERT BROS., WALSALL,**
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Ltd., Short St., LAMBETH.

# DON'T ADOPT EXPENSIVE MACHINERY



BUT USE THE
PATENT
**"RAPID"**
**POWER CHARGING APPARATUS**
FOR LARGE WORKS.

Can be seen at work by appointment.

**Biggs, Wall & Co.**
13, CROSS STREET, FINSBURY
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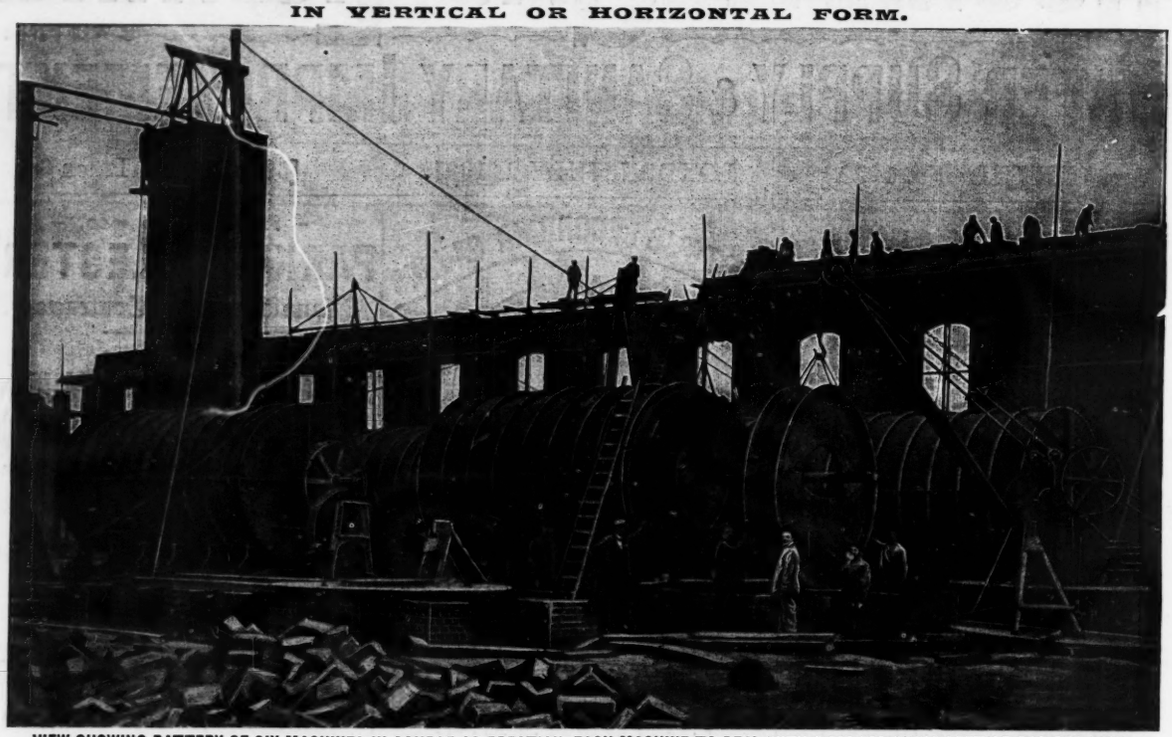
TELEGRAPHIC ADDRESS:
"RAGOUT, LONDON."

W. C. HOLMES & CO.'S

PATENT "NEW" SCRUBBER-WASHER

IN VERTICAL OR HORIZONTAL FORM.



VIEW SHOWING BATTERY OF SIX MACHINES IN COURSE OF ERECTION, EACH MACHINE TO DEAL WITH 3,000,000 CUBIC FEET OF GAS PER DIEM.

W. C. HOLMES & CO., Contractors to His Majesty's Government, TURNBRIDGE, HUDDERSFIELD.

R. LAIDLAW & SON

ENGINEERS & IRONFOUNDERS.

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OF EVERY DESCRIPTION.

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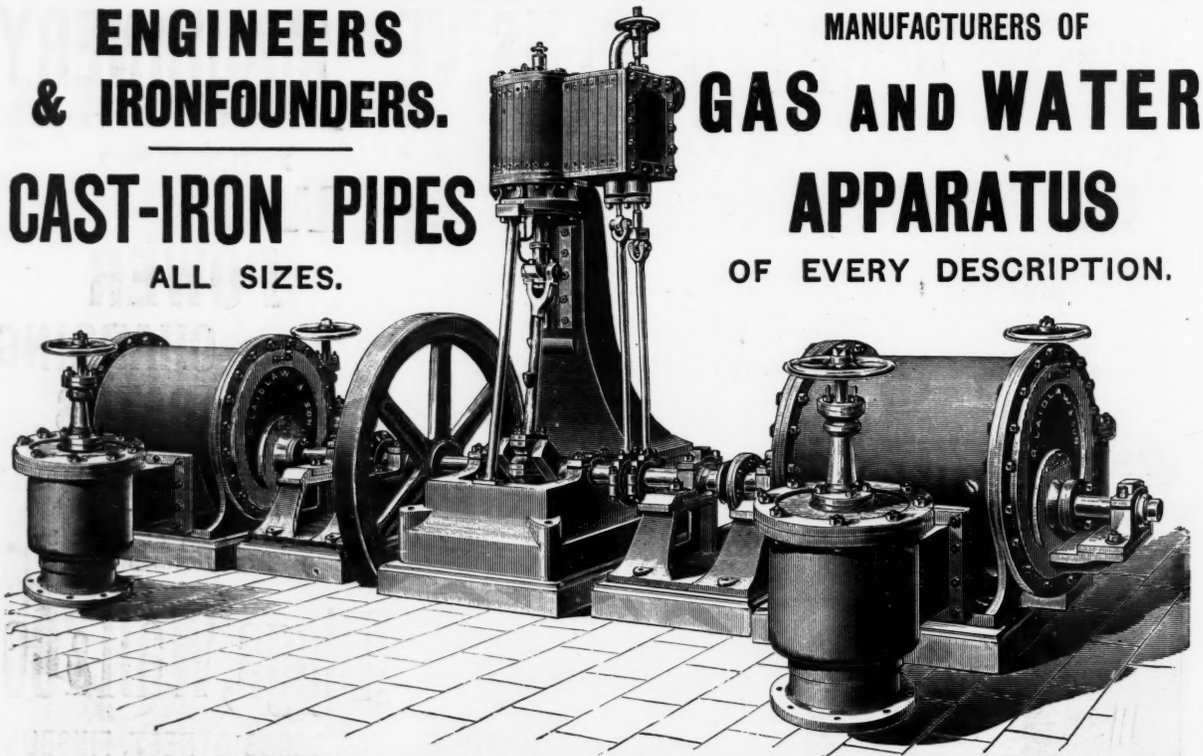

BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED—ALL SIZES.

ALLIANCE FOUNDRY, GLASGOW. | SIMON SQUARE WORKS, EDINBURGH. | 6, LITTLE BUSH LANE, LONDON, E.C.

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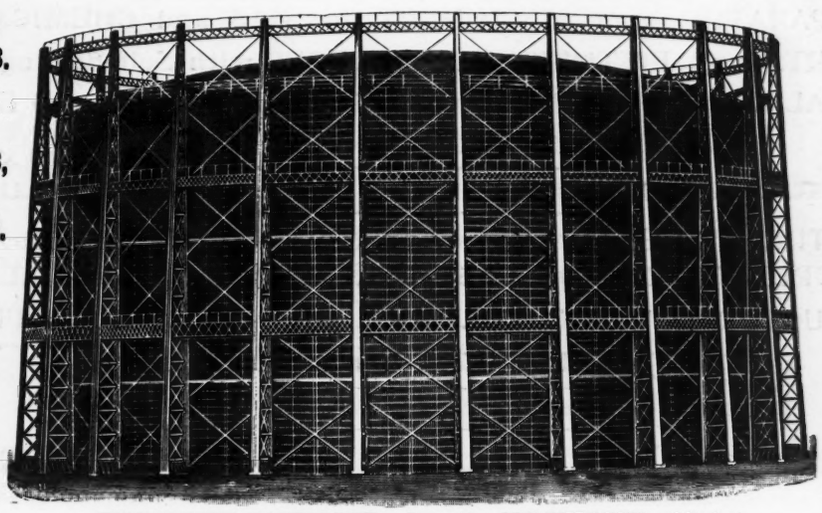
ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.



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GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.

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240 feet Diameter by 45 feet Deep each Lift. Erected at Glasgow, 1893.

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Fitted with Detachable Attachments.
Arranged for 1d., 1s., or any other Coin desired.

Dry Meter in Tin-Plate Case, fitted with Attachment.

Price changed *in situ* by means of one Crown Wheel only.

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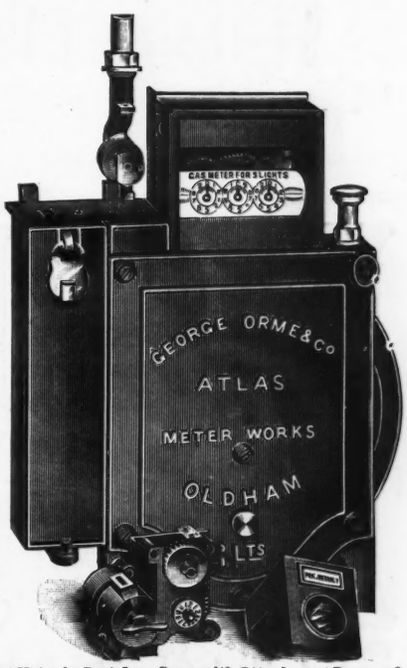
SIMPLE.




Wet Meter in Cast-Iron Case, with Attachment Removed.

Any further Particulars will be supplied upon Application.

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Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

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**PURIFIERS with Planed Joints a Speciality.**

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*DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.*

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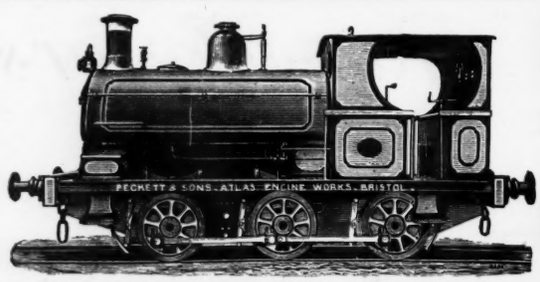
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents

Telegraphic Address: "PARKER, LONDON."

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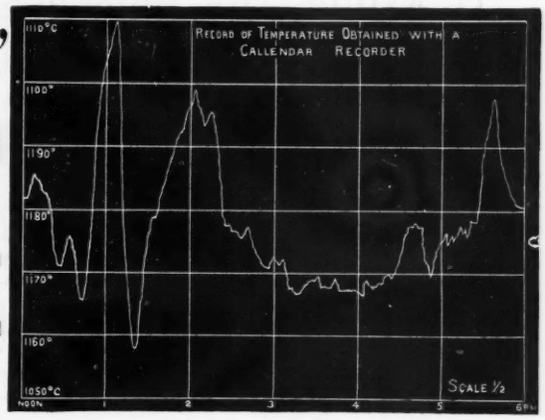


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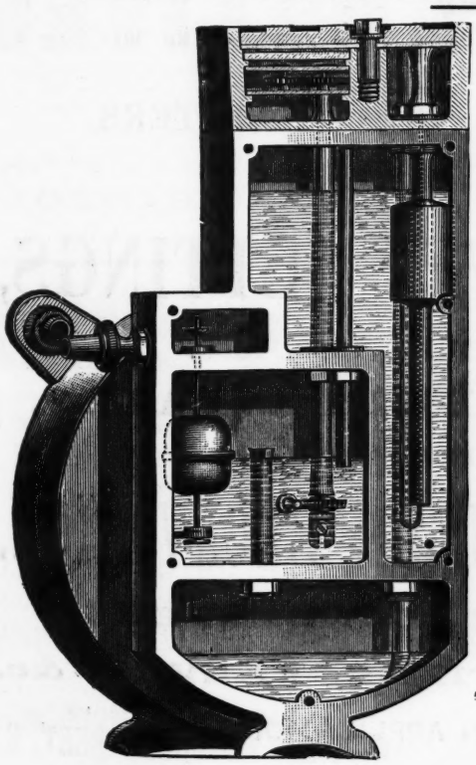

**Sole Makers of Green's Patent Underground Wet Gas-Meters for Street Lighting, &c., and Ogden's Patent Spindle Tube for Wet Gas-Meters.**

## GREEN'S PATENT UNDERGROUND METER

Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost. No box is required; and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s.; and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6¼ inches by 3½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid which does not injure the fittings; and this can be supplied at about 1s. 3d. per gallon.

*Prices and all Information on Application.*

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# INCANDESCENT PETROLEUM LIGHT

IS THE

## CHEAPEST & MOST BRILLIANT SYSTEM OF STREET LIGHTING

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**IT AVOIDS THE NUISANCE OF TEARING UP THE STREETS.**

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**SUITABLE FOR WORKS OF EVERY CAPACITY,**

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**BECAUSE** Coin is withheld in Mechanism until ***Gas is consumed***, when it falls into Collecting Box. No adjusting entries or credits necessary.

**BECAUSE** Change Gear is not only outside, but on the right, and most get-at-able side; is therefore easily got at, and altered in One Minute. No necessity to disconnect Meter.

**BECAUSE** Mechanism is not deranged by the use of bent or battered Coins.

**BECAUSE** There being no handles to turn when inserting Coins, no Jamming can take place when a succession of Coins are put in.

**BECAUSE** Twenty-four Coins can be placed in coin receptacle at once. Money-box (patented) is extra large, strong, novel, and detachable; no handles or hinges to break.

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An action was instituted by that Firm against **THE BRIGHOUSE CORPORATION** in the High Court of Justice asking for an injunction restraining them from Infringing their alleged Patent Rights.

After entailing considerable expense upon themselves and upon the Corporation the **NEW CONVEYOR COMPANY** had to abandon the Action, and have **NOW TO PAY ALL COSTS AND EXPENSES** connected with the same.

**JONAS DRAKE & SON, OVENDEN, HALIFAX.**

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**W. J. JENKINS & CO., LIMITED, RETFORD.**

**WINSTANLEY COMPANY, COVENTRY.**

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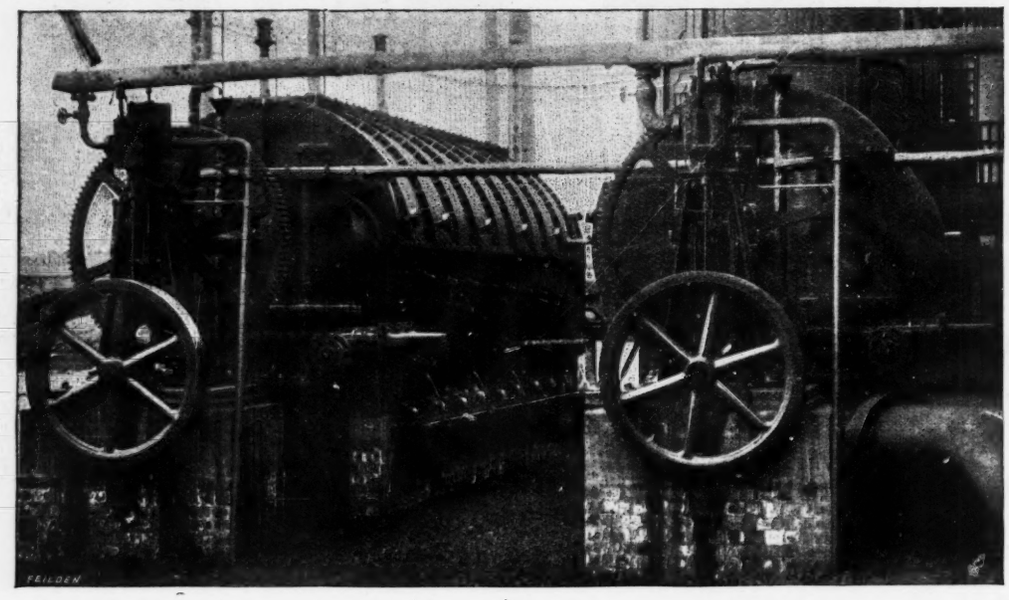
**Cubic Feet of Gas per day are now being Purified by**

# PATENT "STANDARD" WASHER-SCRUBBERS

**which extract ALL the Ammonia and a large proportion of the $CO_2$ and $H_2S$.**

Prevention of Slip of Gas Unwashed.
Strength of Liquor Concentrated.



Maximum Washing Surface.
Easy access to interior.

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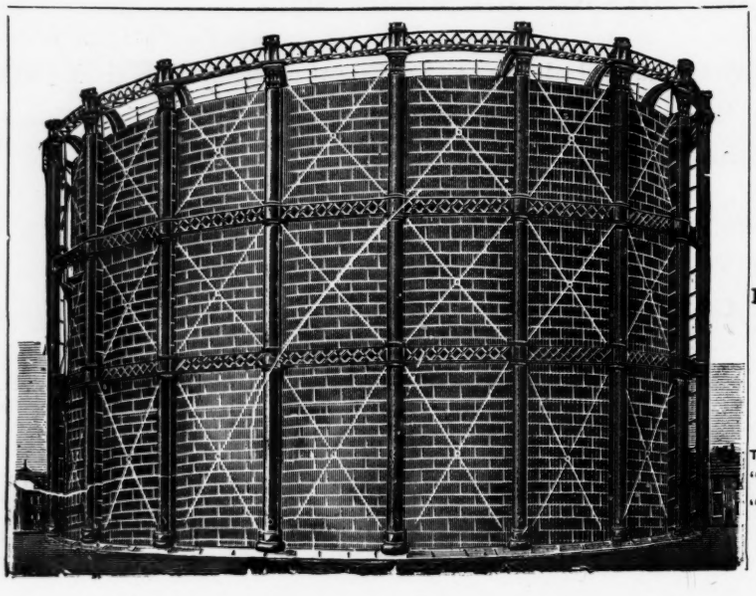

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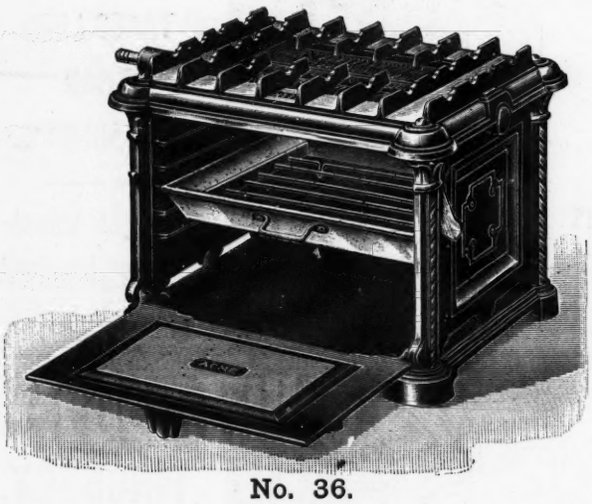

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**Gas Companies name cast on for quantities.**

**No. 36 - - 9s. 6d.**

13 in. wide by 10½ in. deep by 10 in. high.

**NOTE SIZE & PRICE BEFORE PLACING ORDER.**

It is fitted with our well-known grilling burner and new patent grilling plates, which heat **instantly** all over.

**Arden Hill & Co.** "Acme" Gas Stove Works, **Birmingham**

(Now JOHN WRIGHT & EAGLE RANGE Ltd.) LONDON, LIVERPOOL, MANCHESTER, AND BRISTOL.

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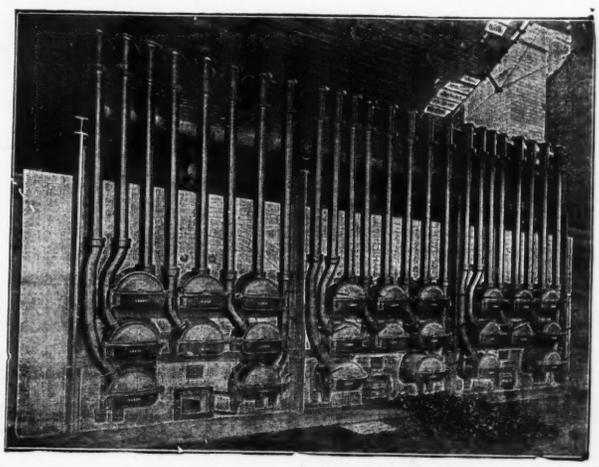
INCLINED,
HORIZONTAL,
REGENERATOR,
GENERATOR,
AND
DIRECT FIRED.

RETORTS RE-SET.



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NUMEROUS TESTIMONIALS.

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THE PATENT
**"RAPID" MANUAL CHARGING APPARATUS.**

REPEAT ORDERS FOR MACHINES
At the following Places:
Two Machines NEWPORT (MON.)
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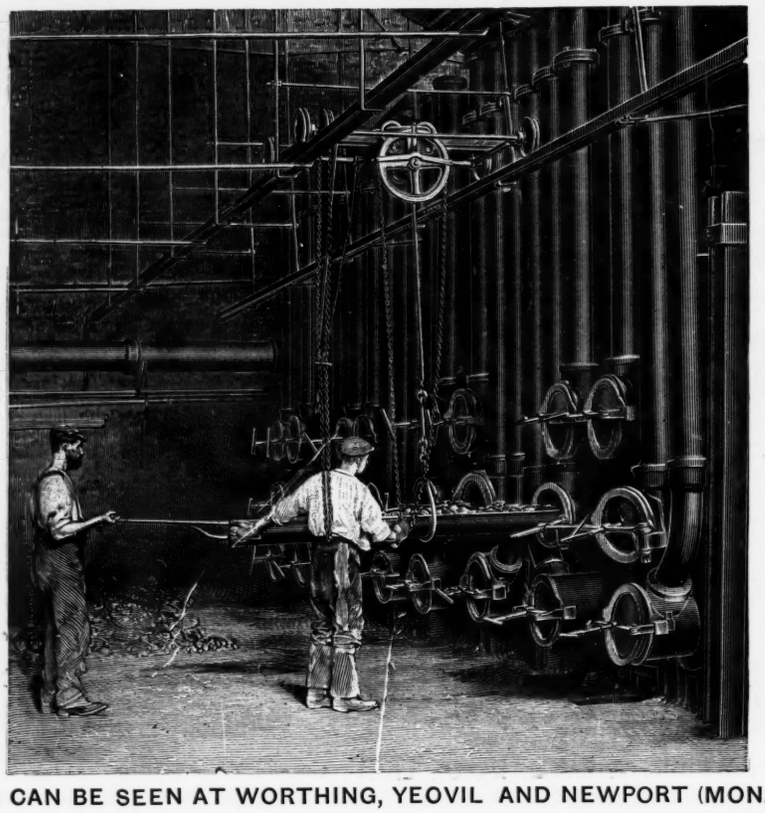
One Machine TRURO.
One Machine YEOVIL.

MACHINES IN COURSE OF ERECTION:
Two Machines NORMANTON.
One Machine SHERBORNE.
One Machine WARMINSTER.
One Machine WHITTINGTON.
Four Machines SHREWSBURY.



**4 CWT. CHARGE TAKES LESS THAN ONE MINUTE.**

Telegraphic Address:
'Ragout, London.'

13,
**CROSS ST., FINSBURY, LONDON, E.C.**

THIS MACHINE CAN BE SEEN AT WORTHING, YEOVIL AND NEWPORT (MON.) GAS-WORKS.

# *NAPHTHALENE*

**(Young & Glover's Patent, No. 20,125 of 1896.)**

This Patent entirely covers the Use of Heavy Oils in the **TREATMENT OF NAPHTHALENE,** or in the Extraction of Same from Coal Gas.

By arrangement with the Proprietors of the above Patent, we are now prepared to receive enquiries and consult with Managers of Gas-Works where trouble is experienced with **NAPHTHALENE DEPOSITS,** and to instal the necessary Apparatus.

## JAMES MILNE & SON, LTD.

**GAS ENGINEERS,**

**Milton House Works, EDINBURGH.**

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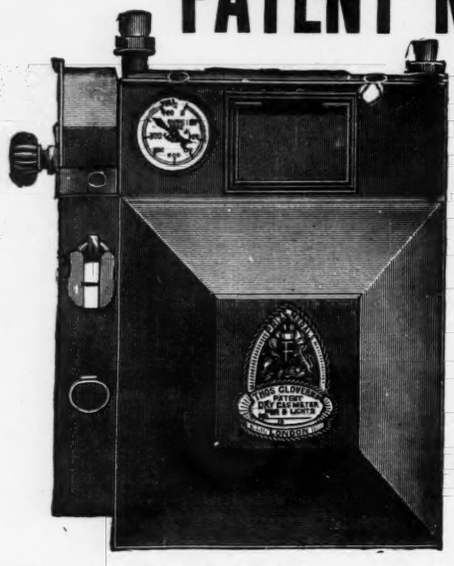

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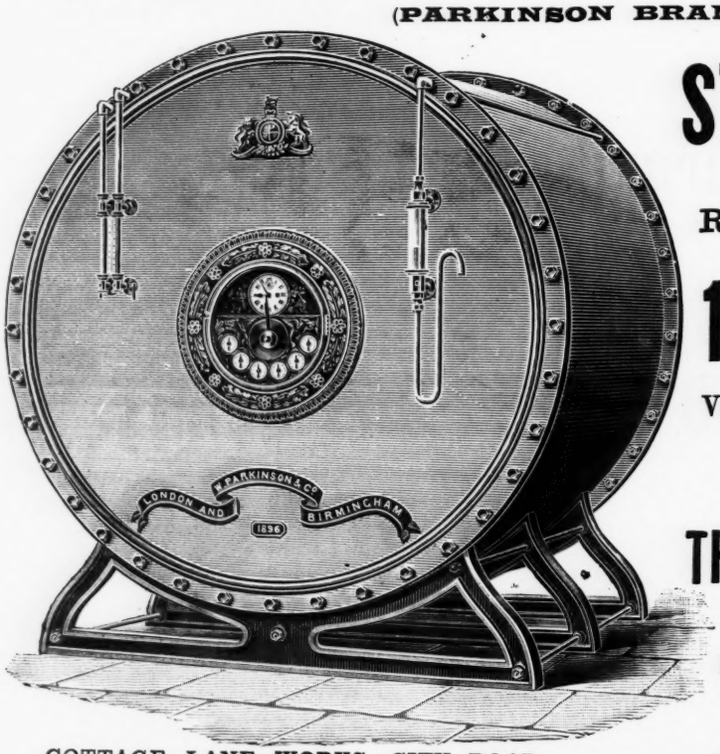


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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

VOL. LXXVIII., No. 1990.——TUESDAY, JULY 2, 1901.

# EDITORIAL NOTES.

## The Coal Tax Debate.

AFTER a discussion extending over three evenings, and culminating in a "scene" by no means creditable to the prominent actors therein, clause 3, which imposes a duty of 1s. per ton on coal, coke, and other descriptions of fuel containing, or the products of, coal, exported from the United Kingdom, was (by a majority of 86) ordered to stand as part of the Finance Bill. Not, however, before the coal trade had received from the Chancellor of the Exchequer two considerable and, on the whole, equitable concessions—one temporary, the other permanent. Coal exported before the end of the year under contracts entered into prior to the introduction of the Budget will, subject to certain conditions, be exempt from any duty. The conditions provide that the contracts shall be for definite quantities at definite prices; that they are covered by buying contracts where the exporting vendor is not the owner of the coal; and that, where the contract is for a longer period, the quantities exported thereunder this year shall not exceed the proportion deliverable by Dec. 31 next. A good case can be made out for these exceptions, though they may press hardly upon sellers who have undertaken to supply buyers' "requirements" without any quantity named. They will, however, in all probability give rise to considerable friction with the Customs; and the expenses of collecting the watered-down duty will be heavy in proportion to its yield in the current financial year.

The second, and permanent, concession made by the Chancellor is the entire exemption from duty of all coal of a declared value not exceeding 6s. per ton. It was evident from the first there was considerable injustice in imposing upon the cheaper qualities of coal—the "smalls" or wastage incidental to the hewing of large coal—as heavy a tax per ton as that placed upon the better-class steam, gas, and household coals. In times of slack trade, there can be little doubt that a tax of 1s. per ton would render it altogether unprofitable to the coalowner to bring the small stuff to bank in any quantity greater than the home market would absorb; and in so far as the waste was allowed to remain in the workings, the cost of production of the large coal would be enhanced, and the risk of explosion in the mines would be increased. The Chancellor has, therefore, done wisely in exempting from the export duty the lower-priced coals, though the arbitrary limit fixed—6s. per ton—will have the curious effect of giving the foreign buyer several pence per ton when such coal is at a market level of from 6s. to 7s. per ton f.o.b. It will pay the coalowner better to sell at 6s. than at, say, 6s. 6d. per ton, duty paid; so that the foreign buyer who would give the higher price will get his coal at the lower. As, moreover, it will be immaterial to the coalowner whether he obtains 7s.–1s. per ton or 6s. per ton for his coal, he will naturally sell at the lower price in order to please the buyer—business coming before patriotism with most people. Thus the nation will lose, and the foreigner gain, whenever the market value of small coal falls to 7s. a ton or thereabouts, until it is actually down to 6s. a ton.

Compromises usually lead to anomalies; and the practicable course in life often consists in choosing the least disadvantageous of several methods. That is what must be said in favour of this arbitrary distinction as to taxation between coal worth more than 7s. and that worth less than 6s. per ton. The ideal plan would obviously be an *ad valorem* tax; but the Chancellor of the Exchequer rejected the proposal on the ground that it would, in his opinion, "entail so many "chances of fraud, and so many causes of dispute between "the Custom House officers and the persons interested, and "so much continued trouble to the trade, as to render it "unreasonable and almost impracticable." We must say the argument does not appear by any means conclusive, as it would apply with almost equal force against the plan adopted; while the further argument used—that the profit on high-priced coals is not in all cases so great per cent. as that on the cheaper qualities—seems quite inconsistent with the Chancellor's firm conviction that the foreign consumer, and not the coalowner, will bear the tax. Since the buyer will pay the tax, what has the profit per ton to do with the question? However, the tax and the method of its application are somewhat in the nature of an experiment; and experience alone can show its actual workings, and point the way to amendments. The whole matter will, it is to be hoped, be fully and dispassionately considered before very long by a Commission of Inquiry, the appointment of which the Chancellor of the Exchequer has already declared himself willing to recommend to the Government. The Commission will, by the time they are in a position to take evidence, have the advantage of learning in some degree how the tax is working in practice—though, as Sir James Joicey said, and Sir Michael Hicks Beach agreed, the whole effect of the duty will not be ascertainable in a less period than two years—whereas the public and the House of Commons have up to now had little more to guide them to a right judgment than the often exaggerated and highly-coloured statements of interested parties.

The debate on the clause was, indeed, almost wholly barren. Quite the best speech delivered against the duty was that of Mr. Robson; while its defence was conducted with great skill and courtesy by Sir Michael Hicks Beach, who has, however, had such an arduous time of it since "Budget Night" that he is reported to have declared that he wished he had never touched coal. He will doubtless find consolation in the proverb as to the cost of the first step. To maintain the duty in future years will not require a prolonged fight; and the yield will be more substantial than it can be during the present year. Its effect upon the coal market at home and abroad will be watched with considerable interest by those concerned with the gas undertakings of this country. So far as the gas industry abroad is concerned, the amount of the duty is practically the only point of interest; for it is certain that nothing short of a heavy tax will prevent Continental gas undertakings at present drawing their supplies from this country from continuing to do so. This fact was very emphatically declared by the opponents to the duty; an amendment being moved by Mr. D. A. Thomas designed to limit the incidence of the tax to "smoke-"less steam and Durham gas" coal.

## Incandescent Gas Lighting at the Gas Institute.

THE papers and discussion on the high-power branch of incandescent gas lighting at the Gas Institute meeting threw a good deal of enlightenment into several mysterious corners of this interesting subject. In the first place, those gas engineers who followed what was said must have come away with the impression that the absolutely best way of working experimentally with an incandescent mantle and burner is not a matter of common understanding. Of Mr. Scott-Snell's paper we are desirous of speaking with great respect, as a perfectly candid description of an extremely ingenious device. It does not, of course, affect the larger question of whether the purpose to which it is directed is a proper or necessary one. For the time being, without doubt, it is. High-pressure gas lighting by incandescence is the fashion, and it is a very good and admirable fashion. With reference to Mr. Grafton's paper, the best that can be said of it is that it revealed a story of patient labour, carried on in a laboratory, without regard to the requirements of the world outside. Mr. Sugg's paper is, as a matter of course, beyond technical criticism. We cannot presume to teach Mr. Sugg anything about gas-burners, in a practical way, though we may not always agree with his theories of their performance. This, however, is the conclusion of the whole matter: If we would know what a particular burner, or mantle, or gaseous mixture will do for us in the way of giving light, there is only one means of obtaining the answer—which is, by trying the experiment. Now, there are various ways of experimenting; and the value of the result depends on the judgment of the experimenter. If he chooses to employ a series of unpractical conditions, such as would never be met with elsewhere, his results may be striking, but they can hardly be of any practical use. There is far too much of this order of experimenting, which darkens counsel.

On the other hand, Mr. R. G. Shadbolt's method of experimenting with incandescent gas-burners seems to be

guided by much judgment, and a clear understanding of what it was that was wanted. He started with the best gas-burner to be obtained for ordinary working—the Kern standard burner—and tried to discover how to work it to the best advantage. What, we may ask in passing, is the ordinary gas engineer's idea as to the precise office filled by the pressure of the gas or the air supply in increasing the luminosity of a Welsbach mantle? Why does raising the pressure above the normal at once produce a better light? Not an easy question to answer. Mr. Sugg declares that there is "no pressure" inside the mantle. There is velocity; but no pressure. This can only mean that the pressure is converted, at the point of issue of the jet, into the velocity of movement of the latter—with the object of making the combustible mixture fill the mantle. Again, this also means that high pressure has only a relative value; other devices being competent to produce the same result. Or, in other words, the virtue of the burner does not grow in direct proportion with the increase of pressure. The importance of this deduction is that it demolishes the notion, which might otherwise prevail, as to the existence of a critical pressure for the most advantageous working of all incandescent gas lights. There is nothing of the kind, either at 9 inches or any other conventional figure.

True, certain makes of burner, and certain mantles of a particular size and substance, will give a better light at 9 inches pressure at the injector than they do at 3 inches pressure; but the reason for this is a matter of structure and dimensions. There is no magic about the pressure, which is only a means to an end. It is because of this consideration that we are led to question the permanent value of every artificial pressure-increasing device in this connection. The Welsbach light is not truly a low-pressure appliance, because it requires a kind of blowpipe flame. It needs, indeed, a blowpipe flame turned inside out, so as to get the place of most intense heat where the mantle is—on the outside of the flame. The Kern burner is a device for effecting this purpose. One accessory to it is a very complete preliminary mixing of the air and gas in the body of the burner. Those gas engineers who complain that the Kern burner does not answer with their make of gas, would do well to take the hint, and see what it is that hinders this commixture. Eventually, the pressure at which ordinary gas is delivered will be raised sufficiently to work Kern and other burners, with mantles of the dimensions and make that experience shows to be best, and special pressure-increasers will not be needed except for very peculiar applications. This is the result that must be groped for by experiments, the proper object of which is to get the largest superficies of mantle incandescent at the highest temperature.

There is no mystery, happily, about the source of the light in this system. It is intensity of heat, and nothing else. So far as is known, the Welsbach mantle will withstand for any length of time the fiercest heat that a gas-flame can develop. Platinum melts on the surface of such a mantle, when rightly placed in the flame; but the skeleton of the mantle itself is stronger then than when cold, because the substance is very nearly plastic. Mantles wear out by attrition, caused by friction; and consequently they eventually break down, but not, as a rule, before they have become so thin as to have deteriorated in lighting value. In the course of the Gas Institute discussion, the inevitable question was asked as to when a tough mantle, such as domestic servants could knock about with impunity, may be expected. It should hardly be necessary to answer, "Never!" Seeing what it has to do, the mantle must be tenuous and light. There is nothing to be gained by making some things overstout; and the substance of an incandescent gas-burner mantle is prescribed by its use. Nobody really wants to remove mantles from their place on the burner, and roll them along. If this were possible, some people would wish to know why they could not carry them about openly, or in their pockets. The true remedy for all that can be reasonably complained of upon this score is an efficient system of maintenance by the gas-supplying authorities or their agents. The handling of incandescent mantles is not a proper care for householders or their servants. Their attempts to do it have only served to give the system a bad name, whereas the blame should rest upon the gas authorities. How long will it take to persuade the sellers of gas that they ought to go to some pains to make their commodity popular? The trouble is, not that incandescent gas-burner mantles are too slight, but that the heads of some gas directors and committeemen are too thick.

### An Electrician on Street-Lighting.

It is always pleasant to hear a shoemaker chanting the praises of leather. He knows his subject so well, and believes in his opinions so heartily, that it is a comfort and joy to listen to him holding forth in a pessimistic world which doubts everything, even to the reality of its own doubts. The week before last a Municipal Electrical Engineer wrote to a sympathetic technical journal to state, in the simplest of language, his faith in electric arc lamps as being "undoubtedly" the "best method of street-lighting." Why! certainly. The writer went on to confess that public authorities usually object to this style of lighting on the score of expense. He likes arc lamps spaced about 30 yards apart in central localities, and 40 to 60 yards apart in less frequented districts. One would like to know where this standard of street arc lighting is followed. It means about 58 lamps to the mile, which at £30 a year apiece amounts to the trifle of £1740—say, to all intents and purposes, £1 per yard run of street for electric lighting. It is an easy figure to remember; but one can quite understand that it does not commend itself to all local authorities. They find incandescent gas-lighting to be cheaper. This is admitted to be the fact "for such light as gas gives; but, light for "light, there is nothing cheaper for public illumination "than arc lamps." Perhaps not, if the electrician is allowed to rate the illuminating power of both kinds of lighting. He is a poor tradesman who would not be equal to a little thing like that. But this writer is an unconscious humorist in other respects. He sagely lays it down that, "where the "electric lighting is in the hands of the municipality, the "current ought to be supplied for public lighting at cost "price per unit (that is, after interest and sinking fund have "been allowed for) with the addition of about 7 per cent., "to cover the cost of attendance and depreciation." Would not the gas interest like to see so salutary a rule obeyed in all cases! Is it done anywhere? Ask the public authorities of such places as Hastings—to mention only a single instance that occurs to one's memory—whether this is their idea of electric lighting at cost price. If there is anything more uncertain than the illuminating power of a municipal arc lamp, it is the cost of it; and on both heads authentic information is desirable.

### Profit-Sharing as a Magazine Subject.

A new monthly magazine of a commercial kind, called the "Imperial Argus," has appeared with an article on Profit-Sharing in the first number. Our young contemporary declares that one of its aims is to procure free discussion of the means whereby the present relations of capital and labour may be ameliorated; and it will have our best wishes for success in this praiseworthy project. We are always discussing the subject in these columns, and there is much argument "about it and about" in all the newspapers; but somehow those who indulge in these debates generally end where they began. This is for the reason that such a matter is essentially political in character; and politics are a mass of preconceived ideas. Political debate does occasionally influence votes, but very rarely. What generally happens is that politicians engage in debate in order to give, or to find, reasons for acting in accordance with what they are pleased to call their principles—meaning, usually, their prejudices. That is the worst of these discussions, whether at professional gatherings or in journals. There is no heart in them. Mr. George Livesey, Mr. E. W. T. Richmond, and other convinced friends of profit-sharing, will gladly sing its praises; while other employers who are able to get on without it do not see any reason to adopt it. The issue is complicated by the attitude of the Trade Unions. It is difficult to see why Trade Unions should object to profit-sharing; but there is no doubt as to the fact. If some prominent politicians of this brand will kindly come forward and give the reasons why they are averse to the system, it would be an advantage. There is small prospect, however, of their doing anything of the kind, inasmuch as this aversion, if and where it exists, is one of the real controlling motives of Trade Union policy; and these motives are never avowed, much less discussed, by those who hold them. That is why employers of labour, and the general public who derive their information concerning such matters from newspapers and platform orators, take such different views of the merits of Trade Unions. The employer knows all about them at first hand, and at his own expense; the newspaper writer and his readers are only able to judge from the outer surface of form and pretence.

### Sir John Kennaway's Committee and Electrolysis.

As we briefly recorded last week, Sir John Kennaway's Committee passed the preamble of the London United Tramways Bill without requiring the insertion of the clause proposed by the Chelsea Water Company for the protection of their mains from injury by electrolysis. It was the familiar question of the adequacy of the Board of Trade regulations to protect other property from the accidental leakage of electric tramway currents; and all the evidence tendered on this occasion went to this point. Fresh facts were adduced, relating to the electrification (and consequent electrolytic injury) of gas and water pipes in London and Liverpool. The Committee, however, did not see their way to go beyond the revised model clause of Lord Cross's Committee, as incorporated in the Bill; and accordingly the special protection asked for by the Chelsea Company was refused. All this only means that a great responsibility rests upon the Board of Trade to do everything that may be really necessary for the protection of the enormous interests confided to their charge. Nobody would deny that, if the Board's regulations are not effective, they must be made so. The contention of their adequacy rests almost entirely upon the instances of Bristol and other places where the regulations are in force, and where it is asserted that no electrolytic injury to gas or water mains has occurred. On the other hand, there is already sufficient evidence available from South London and Liverpool to satisfy numerous scientific men that serious damage may be done under cover of the regulations. Indeed, it is curious to note that there was practical agreement upon this head among all the electricians who gave evidence for and against the Tramways Bill. The facts of electrolysis are not susceptible of being disputed; the only thing doubtful being matters of degree and questions of probability.

### A Batch of Interesting Matters.

Several matters of interest in connection with Labour Questions have transpired during the last week or two. In France, the subject of Old-Age Pensions has been carried (with a degree of impetuosity characteristic of the French genius) to the point of the production of a Government scheme of legislation. While the most instructed statesmanship at the service of this country is feeling the way, with the utmost deliberation, to a generally acceptable scheme of the kind, the French Government and Legislature appear to be quite ready to deal with the business as light-heartedly as one of their predecessors rushed to Sedan. And from what an English observer can see of the scheme in question, its adoption by a country already so heavily taxed as France is, would go a long way to precipitate a financial Sedan. It is impossible to prophesy, however. France is the country where anything might happen; and especially is it a land of untold wealth. What tends to make the doings of the French so absorbingly interesting in the eyes of the world is not alone the supreme intellectual gifts of the people, but also the willingness of the mass of French citizens to follow any line that strikes them as being logical.

In introducing the Labour Pensions Bill, M. Caillaux, the Minister of Finance, made a statement which deserves a niche in the memory of everyone who desires to possess a competent knowledge of the data of social science. He said that every individual is born into the world a debtor to the community; and, if he does his duty as a citizen, he leaves it its creditor. That is to say, a child comes into an organized and equipped world, and finds here many things provided for him which he certainly has done nothing to deserve. As he lives and does his work in the world, the man progressively wipes off this indebtedness, and, on the average, in the long run, he alters the balance of his account with the community. In the case of a worker for wages, he never has the opportunity of realizing in his own person the indebtedness of society. Wherefore, says the logical French Minister, it is the duty of the State to step in and do it for him—to the tune, in the case of the French Treasury, of 165 millions of francs a year, or a modest £6,600,000 of our money.

It sounds a good deal; and yet the service, if it could be rendered, would be cheap at the money. The Bill has been referred to a Committee, who have agreed upon a proposition that there should be two funds—one created by workmen's subscriptions, and the other by calls upon employers. This is something like our workmen's compensation arrangement, which is bound to be followed up by some pension legislation. Meanwhile, speaking of the former Act, it is remarkable how uniformly appeals of workmen to the Superior Courts are successful. Last week the House of Lords gave a strong ruling in an appeal case, where the sufferer had fallen off a plank connecting a vessel with the edge of a dry dock. The County Court Judge had decided that the man at the time of the accident was not employed on, in, or about a factory within the meaning of the Act; and his decision was upheld by the Court of Appeal. Their Lordships swept away all objections to the inclusion of the appellant within the scope of the Act, and unanimously allowed the appeal. Clearly, it is useless for employers to dispute their constructive liability under the Act, unless they have an exceptionally strong case.

Another matter, which is to be commended to the careful attention of all those amateurs of legislation who affect to believe in the power of Acts of Parliament to do any and everything desired by the framers of them, is the alleged complete failure of the French law requiring shopkeepers to provide seats for their employees. This law followed the precedent of the English Act dealing with the same object—only it is much more drastic, and there is a special force of inspectors appointed by the municipalities to see to its execution. It is now reported (and those who have any acquaintance with the manners and customs of the French shopkeeping population will have no difficulty in believing it) that, although the seats are duly provided as by the law directed, and are even made an ornament in some instances, nobody ever sees them used. The inspectors are desolated. Not a single shop assistant ever wants to sit down. There is no terrorism on the part of the employers or shopwalkers—not a bit of it, that can be laid hold of—but the fact remains that the law is practically set at naught, because it conflicts with the unwritten rule of life in the callings to which it is applied. This is a lesson that the promoters of Miners' Eight-Hours Bills and the like would do well to take to heart.

**The Gas Section of the Glasgow Engineering Congress.**—To the information already published in our columns concerning the technical matter which will be presented in the Gas Section of the Glasgow Congress, we may add that a member of the Société Technique du Gaz has promised a paper on a process connected with the manufacture of water gas; so that the list of papers will now be a fairly representative one in its international aspect. Dr. Leybold, the delegate of the German Association, will in his paper deal with the question of electrolysis.

**Society of Arts.**—The annual general meeting of the Society of Arts was held on Wednesday last. The report of the Council summarized the proceedings of the Society during the last twelve months, giving an account of the various papers which had been read, and the work of the different Committees. Among other matters referred to was the resignation of the presidentship of the Society by the King, who, as Prince of Wales, held the office from 1863. His Majesty, however, while ceasing to be President, has become Patron of the Society. At the conclusion of the reading of the report, the result of the ballot for the new Council was announced; the President for the coming year being Sir Frederick Bramwell, Bart., F.R.S.

**New Fuel Gas.**—We learn from the "Ironmonger" that a patent has been taken out in Germany by R. Escales, of Munich, for the manufacture of a fuel gas by adding a mixture of metallic aluminium in very fine powder and aluminium carbide to water. The carbide evolves methane, or marsh gas, and the aluminium in the conditions referred to evolves hydrogen. Methane, it is well known, burns with a practically non-luminous flame, as does hydrogen; but both give off a great deal of heat on combustion. Thus a fuel gas is prepared which is suitable for use with incandescent mantles, or for heating purposes, and is free from carbon monoxide. It is reported that acetylene lends itself to dilution with the mixture. No means are at present available of judging whether the cost of the gas would be wholly prohibitive.

**The Funeral of the late Mr. G. A. Biddell,** Chairman of the Ipswich Gas Company, whose death was noticed in the "Journal" last week, took place on Thursday, at his native village of Playford. The sad event evoked the most imposing and pathetic manifestations of respect for the memory of a good citizen that had been witnessed at Ipswich for a long time. The procession was headed by about 120 men and boys in the service of the Company, who were desirous of testifying their sorrow at the loss they had sustained by the death of their genial and kind-hearted Chairman. They were marshalled by Mr. Frank Prentice, the Works Manager, and Mr. T. J. Noble, the Distribution Superintendent. The Company were represented by the Vice-Chairman (Mr. D. Ford Goddard, M.P.), several of the Directors, the Engineer and Secretary (Mr. J. T. Jolliffe), the Solicitor (Mr. G. J. Notcutt), the Accountant (Mr. G. A. Mallett), the Chief Rental Clerk (Mr. W. A. Garrard), and members of the staff. The hearse was followed by about thirty carriages; and a large congregation assembled at the church, in the picturesque surroundings of which the body was laid to rest.

# WATER AFFAIRS.

## The Position of Rivers Boards.

THE Bill to sanction the important scheme by which the Leeds Corporation will be enabled to considerably augment their water-works, has passed safely through the Upper House, in which it originated. Certain modifications of the plans, as already mentioned in the "JOURNAL," have been made, and the objections of opposing landowners removed; so that, as far as can be foreseen, the progress of the Bill through the Commons will not be impeded. When it came before their Lordships for third reading, on Monday last week, the Earl of Crewe took the opportunity of calling attention to an incident which occurred in Committee. Taken on the whole, the scheme is favourably regarded by the county authorities; but, as there were certain minor points upon which safeguards were thought to be needed, the West Riding Rivers Board were instructed to prepare a petition against the Bill. The Committee, however, refused the Board *locus standi;* and it was this action which his Lordship deemed it advisable to bring under notice before the final stage was passed. He pointed out that an additional Standing Order had been specially framed to give County Councils a right to appear before a Committee in the case of any proposal likely to affect the water interests of the county; and he suggested that, as the Rivers Board was composed of eighteen members of the County Council and twelve representatives of the great cities and county boroughs, they were entitled to be heard. Such a concession would, he argued, only be following the precedent set in the Halifax case, in which the *locus* of the Board had been allowed. The noble Earl had nothing to say against the view taken by the Committee; nor did he propose to ask for the rejection, or even the recommittal, of the Bill. His only object was, he said, to put it to the Chairman of Committees (Lord Morley) whether it was not feasible to include Rivers Boards in the Standing Order alluded to, seeing that, though they were specially connected with water, they were, as a matter of fact, the County Councils of their respective districts. Anything which tended to the consolidation of their position must, he thought, be to the advantage of the procedure of the House; and therefore he urged upon Lord Morley the consideration of this matter, when the time came for amending the Standing Orders.

It is not often that either House is called upon to give its attention to a Bill which has passed a Select Committee, and comes up for third reading; but this has been done on a far less important question than that raised by the Earl of Crewe. To grant a privilege to some representative bodies, and deny it to others composed, to a very large extent, of members of those bodies, seems, at first glance, to be rather inconsistent. But the inconsistency disappears on reading the Standing Order which governed the decision of the Committee on the Leeds Bill. It is there clearly expressed that *locus standi* is to be allowed to "the Council of any "administrative county" that may be "injuriously affected" by the provisions of a measure relating to the water supply of a town or district. Was the Rivers Board a County Council? Obviously not. Did it come within the terms of the Standing Order on the ground of being included in the word "Council"? Lord Hawkesbury, the Chairman of the Committee, failed to see that it did; while Lord Morley was most emphatic in his declaration that it did not. The former explained that the main reason for the Committee refusing *locus* in the present case was because the Board was an authority constituted under Acts of Parliament passed with the express object of preventing the pollution of rivers. There was no question of pollution here, though an attempt was made to prove that interference with the flow of a stream amounts practically to pollution, inasmuch as the abstraction of half of the water would make the contamination of the remainder doubly possible. This, of course, was hypothetical, and not actual, pollution; and, unless there was risk of objectionable matter finding its way into a river by the operation of the Bill, the Board had nothing to do with it. When this occurred, it would be time to intervene. Moreover, though a portion of the works contemplated by Leeds were to be situated in the West Riding, some of the reservoirs had been taken out of the Bill. The Earl of Crewe had cited the case of Halifax in support of his claim. But Lord Hawkesbury pointed out that in that and some other cases *locus* had been allowed for special reasons which did not exist here; and he said he was sure no Committee would refuse to take any evidence which would help them to come to a right decision in an inquiry they were conducting.

As already explained, the Earl of Crewe's main object in arresting the progress of the Bill was to ask the Chairman of Committees to amend the Standing Orders in the direction indicated. He said he thought such a body as the Rivers Board ought to be in a position morally to demand *locus standi*, unless there were strong reasons for disallowing it. Lord Morley admitted that there had been a certain amount of inconsistency in procedure in the past. He also acknowledged that these Boards have practically the same powers as County Councils in the administration of rivers; and he confessed that it seemed desirable that Committees should, if possible, admit evidence from them in the few cases where the claim to be heard would be made. He, however, suggested to Lord Crewe that it would scarcely be worth while to alter the Standing Order for so small a number of applications as would be likely to arise. At the same time, he promised to consider the matter carefully. Lord Hawkesbury rather favoured the retention of the Order in its present form, for the reason that it might be useful in making Rivers Boards more cautious in undertaking opposition, and prevent them from causing what, in many cases, might be unnecessary waste of the ratepayers' money. The question now rests with Lord Morley, who may be relied upon to deal with it in the best interests of all parties concerned.

## An Assessment Problem.

THE valuation of gas and water works for assessment has been for many years a fruitful source of dispute between the parties concerned. On the one hand, the makers of the rates—the Assessment Committees—try to get the "utter-"most farthing" out of the property rated; while the occupiers naturally strenuously oppose all attempts in this direction. The matter comes before the Justices at Quarter Sessions, whose decision is probably overruled by the Superior Court. The recent quinquennial re-valuations in the Metropolis have fortunately passed off without many columns of the "JOURNAL" having to be filled with reports of appeals—differences which arose having been settled. Some space in last week's issue had, however, to be occupied with a case which lately came before Justices Ridley and Bigham, in the King's Bench Division of the High Court of Justice, for their opinion. It was stated by the Hertford Justices, who had upheld an attempt made by the Assessment Committee of the Hertford Union to make the New River Company pay an increased assessment of £3180 in respect of their intake from the River Lea, the property in connection with which had, up to January last year, been rated at £650. The smaller sum was charged on the "gate-"house, sluice, and appurtenances;" and the larger one, on what was called the "intake." The Company appealed against the assessment; contending that they did not occupy any rateable hereditament coming within the latter description—that, in fact, no such hereditament existed in the parish on behalf of which the rate was levied. The Committee based their claim upon an alleged enhanced value which had accrued to the property by reason of certain additional sums which the Company had been ordered by Parliament, in the Lea Conservancy Act of last year, to pay for the water taken from the river at this spot; but the Company contended that no increase ought to be made in the assessment merely in respect of the water flowing over the intake. The point for the Court to decide, as stated shortly by Mr. Justice Ridley, was this: Was it right that the increased assessment, which represented the "user" of the water, should be regarded as part of the structural cost of the intake, and be taken into account? He thought that it was not. The right to abstract the water from the river was not connected with this particular piece of land; and therefore the increased assessment based upon such alleged connection was erroneous. Mr. Justice Bigham concurred, and the appeal was allowed. We cannot see how any other conclusion could have been come to, for the reasons fully set forth in the report. The Committee's action was, as Mr. Marshall, who appeared for the Company, put it, like charging a gas company with an increased assessment for the use of the gates by which the coal came into their works, after having previously assessed the mine for the coal. The Company did well to resist this attempt to establish a precedent which would have affected their rating in a number of other parishes; and we hope they may be successful, on appeal, to the Higher Court.

# ESSAYS AND REVIEWS.

## THE GAS AND WATER TRADES EXHIBITION AT VIENNA.

THE exhibition in connection with the gas and water industries which opened at Vienna on the 24th of May, has already been referred to in our report last week (p. 1745) on the meeting of the German Association of Gas and Water Engineers. Nearly all those who attended the meeting of the Association in Vienna on the 16th to the 20th of June, availed themselves of the opportunity to visit the exhibition. Generally speaking, they went away from it disappointed; for it did not merit the glowing reports which had been earlier disseminated about it. There were some interesting exhibits, indeed; but they could be numbered on one's fingers, and it cannot be pretended that the gas industry in particular was reasonably well represented by them. There were only one or two exhibits (these will be mentioned later) which had any direct bearing on the manufacture of gas. On the other hand, many things were shown which had no more connection with the gas and water industries than has the pitcher which is from time to time taken to the well to do with well-sinking. The number of stalls, excluding some few on which technological literature only was found, was about 120; and fully 20 of these had but the remotest claim to a place at a gas and water trades exhibition. But upwards of 100 remain which had better credentials in this respect. Actually, however, very many even of these do not call for mention in the "JOURNAL." We shall not attempt to discuss lavatory fittings, tools, water-taps, and many other exhibits of more or less general interest and utility; nor shall we even enumerate all of the more commonplace gas or water appliances shown.

The exhibition, which was under the immediate patronage of the Grand Duke Leopold Salvator, of the Imperial House of Austria, was held in the rooms and grounds of the Royal Horticultural Society of Vienna. The exhibits were arranged in five principal rooms and in the grounds. The chief room, entered directly from the main entrance to the exhibition, contained 22 stalls of very varied categories. It was lighted at night by means of the "Boule," "Kugel," or "Ball" light, of which an account was given in the "JOURNAL" some time ago (Vol. LXXV., p. 265). The feature of this light, which distinguishes it from other systems of high-pressure incandescent gas-lighting, is that the gas is supplied to the burners at a pressure of over 1 atmosphere, instead of the pressures of 8 to 16 inches of water which are employed in other systems. The mantle, under this high pressure, acquires a globular form, and as the radiation from it is nearly radial, the name "Kugel" or "Ball" has been given to the light—by a happy inspiration of Professor Bunte, we believe.

The original scheme of its inventor, Herr E. Salzenberg, the Manager of the Crefeld Gas-Works, was to employ only pressures of 1 atmosphere and upwards; but we learn that the companies which now work the patents in Germany and France put forward as an advantage of the apparatus as supplied by them that it may be employed either at the high pressures named, or at the relatively low pressure of 0·1 to 0·2 atmosphere. This would seem to indicate that they have not so far found an overwhelming advantage in the very high pressure. Our own impression of the "Kugel" or "Boule" light at the Vienna Exhibition was that it gave no better effect than other high-pressure systems in use there; while it was attended by a powerful hissing, which at close quarters was very objectionable. It was employed in front of the exhibition building, as well as in the main entrance room; and as the building faces one of the famous "ring" streets, which make such a noble boundary for the central or No. I. district of Vienna, it was displayed to full advantage. The globes used were of the familiar electric arc pattern; and the "Kugel" burners certainly illuminated them more steadily and effectively than the fickle arc could have done.

The only doubt we have as to the practical utility of the light is on the score of the extremely high pressure advocated by its inventor, which must entail a considerable extra expenditure of energy in the compression of the gas, and a rapid destruction of the mantles. Whether a sufficiently enhanced illuminating duty is obtained from the gas to compensate for the losses under these two heads, we are unable to say. The duty claimed for the system is 1000 English candles for a consumption of 32¼ cubic feet of gas per hour, provided high-power burners are used. If burners of small size are employed, there is admitted to be a small loss of efficiency.

On either side of the fore-part of the main hall, was a large room. That to the right contained 19 stalls of varied sorts; that to the left 28. Both of these were lighted by the "Millenium" Light Company, by means of roof pendants—one in each room—each bearing in all about 24 high-pressure gas-burners. These were not enclosed in globes; but as the arms of the pendants were long, and the burners were some 30 feet or thereabouts from the floor, the light was practically well distributed and diffused, and the effect was a very pleasing one. On the whole, this installation was the most impressive and effective of the high-pressure systems of gas lighting in operation at the exhibition. We could not ascertain what duty was claimed for the burners.

At the back of each of these rooms, and on either side of the after-part of the main hall, were rooms, entitled the right and left winter gardens. The right one contained 24 stalls; the left one 15. Each was lighted by means of two "Lucas" lamps, supplied by the Deutsche Beleuchtungs-und Heiz-Industrie-Actien-Gesellschaft, of Berlin. Each lamp contained one large mantle, and was said to have an illuminating power of about 440 English candles. They were suspended at a height of about 12 feet from the floor; and with the aid of the numerous lights on some of the stalls in each room, they gave a very fair illumination of these two comparatively small apartments. The effect, however, was not so pleasing as that of the "Millenium" lights in the larger rooms, though it should be added that the total illuminating power of the lights on each "Millenium" pendant was stated to be equal to 7000 English candles, or somewhere about eight times that of the two "Lucas" lamps in each small room.

There was also on exhibition another pattern of high-pressure incandescent gas-light—viz., the "Greyson" high-pressure gas-burner. This was shown by the Société anonyme d'Eclairage et de Chauffage Intensifs, of Brussels, at a side stall, which rendered a comparison of its lighting effect with that of the three systems already mentioned a matter of uncertainty. The gas was compressed by means of a small water-motor, made by Keith's Patent Automatic Gas or Air Compressor Water-Motor Company, Limited, which appeared to work automatically in a simple and trustworthy manner. Each burner was stated to afford a light of 260 English candles for a consumption of 10·6 cubic feet of gas per hour. The light was steady; and there was an absence of objectionable hissing at the burner. The Greyson apparatus is supplied in England by the Intensified Gas-Light Company, Limited, who are the licensees for this country.

This list practically completes the high-pressure lighting exhibits. It will, however, be convenient, before passing away from the subject, to point out that the Music Pavilion and half the promenade in the grounds were effectively lighted by means of simple or uncarburetted water gas, made on the spot in a small plant erected under Dr. Strache's patents by the International Water-Gas Company, of Vienna. We shall refer to this plant again; but may at once state that the lighting carried out by means of the water gas was very satisfactory indeed. The colour was especially good.

In the grounds, about 13 firms had exhibits, many of which were of apparatus and plant in operation. To some of these, we shall revert shortly. In the meantime, we may appropriately follow the above notes on the high-pressure systems of incandescent lighting, with a few words about the incandescent burners intended for use at ordinary gas pressures. These burners displayed no very radical departures from those commonly in use. The notion that a higher illuminating duty could be obtained by the adoption of some simple means of preheating the air supplied to the burner, appears to have appealed to more than one of the inventors whose appliances were shown. It is evident, however, that no considerable preheating of either the gas or the internal air supply is practicable because of the great liability of a heated bunsen burner-tube to provoke the flashing-back of the flame to the nipple at the base of the burner. Something more may perhaps be accomplished with the external air supply.

The "Reform" apparatus, exhibited by L. Vitali and Co., of Vienna, aims at an advance in this direction by means of two concentric glass chimneys. The air supplied to the exterior of the mantle is intended to pass down through the annular space between these chimneys, and to be thereby heated before it reaches the mantle. But as there is provision also for the admission of air directly to the mantle, through holes in the lower part of the gallery which carries the chimneys, and as the stoppage of these holes visibly diminishes the light afforded by the burner, it is evident that the whole of the air supplied to the exterior of the mantle is not actually preheated. Granting that sufficient pre-heating of the external air supply actually occurs to cause some increase in the light emitted by the mantle, the use of two concentric chimneys, in place of the one plain chimney ordinarily employed, must entail an absorption of a considerably greater proportion of the light actually emitted in the two cases. Hence, the increase in the intensity of the light emitted from the mantle must be very great in order to afford a net practical gain in illuminating power after the light has traversed the double glass walls with which the mantle is surrounded. The same criticism applies to other incandescent burners in which the light has to traverse two glass chimneys. Even the best glass causes a loss in light transmitted through it of from 5 to 10 per cent.; and this fact should be borne in mind when attempts at recuperation are made by means of a duplication of the chimney of an incandescent burner. For the "Reform" apparatus, however, whatever may be said against its construction on theoretical grounds, it should be stated that Herr J. Anzböck, Inspector of the Imperial Continental Gas Association at Vienna, testifies that, at a gas pressure of 12-10ths of an inch, the burner gives an illuminating power of 75 English candles, with a consumption of 3 cubic feet of gas per hour.

Somewhat similar to the "Reform" is the "Lampros" light, which was exhibited by Herr H. C. Löwy, of Vienna. It is the invention of Herr Sieverts, of Hamburg, and embodies a modification of the burner top with a view to securing an intense combustion at the surface of the mantle, as well as two concentric chimneys. Dr. Hugo Krüss, the well-known photometrist, of Hamburg, testifies that the "Lampros" burner, consuming 4·6 cubic

feet of gas per hour, at a pressure of 11½-10ths of an inch, gives a light of 140 English candles. We need only add that the burners in operation at the Vienna exhibition appeared to behave quite satisfactorily. Herr Sieverts contends that the proper shape and condition of the bunsen flame for incandescent lighting are attained only by the use of a central disc, somewhat smaller than, and held a short distance above, the mouth of the burner. He makes this disc readily moveable in a vertical direction by the rotation of a ring at the base of the burner, and thus regulates the exact height of the disc from the burner to that which is attended with the highest degree of efficiency. He demonstrates, by means of photographs of the flame produced under varying positions of the disc, the effect of vertical movements of the disc. He recommends that the most suitable position of the disc should be determined for the particular circumstances once for all, and that the regulator should not afterwards be used. He has observed that, for a consumption of about 5½ cubic feet of gas per hour, a flame rising about 1¼ inches from the mouth of the burner is highly efficient. The construction of the Lampros burner has been based on these conclusions from Herr Sieverts' careful investigations.

Greyson incandescent gas-burners for use under ordinary gas pressures were shown in addition to the Greyson high-pressure burner already mentioned. They have a duplicated glass chimney, and the two frusta of a cone, joined at the narrower ends, with which we are familiar in the Kern burner. At a pressure of 6-10ths of an inch of water, they are stated to afford a light of 193-candle power (English) at a consumption of 7·77 cubic feet of gas per hour.

In connection with incandescent gas lighting, there may also be mentioned, as seen at Vienna, either in the exhibition or in the collection of exhibits at the Musical Association's Rooms during the meeting of the German Association of Gas and Water Engineers already referred to, a number of accessory appliances. Herr L. Liebrecht, of Berlin, showed a small regulating device intended to replace the nipple portion of an ordinary "C" type of Welsbach burner. He also showed a handy gas-lighter, consisting of a perforated brass bulb, attached to a handle, and containing a ball of platinum sponge and a platinum wire. The bulb was of such a size that it could be brought within the upper part of the chimney of an incandescent burner, though it would serve its purpose also if merely held above the chimney or above an open-flame burner. On opening the gas-tap, the issuing gas was quickly ignited by the platinum, which the hydrogen in the gas soon brought to incandescence. The bulb serves to protect the platinum from mechanical injuries.

An ingenious lighting device was shown by Herr H. Prescher, of Vienna. Attached to a talc chimney-cap was the platinum-black and wire, which ignited the gas passing up the chimney as soon as the tap was turned on. The up-current of heated gases from the chimney then tilted the carrier of the platinum black in such a way that it was kept out of the course of the hot gases, and only returned to its position immediately above the chimney when the burner was turned off. Provided the platinum remains efficient for a reasonable period, this should prove a practical and serviceable self-lighter for burners at a distance from the gas-tap. The same inventor showed a portable lighting device. Another appliance for igniting incandescent burners was one exhibited by Herr H. Becker, jun., of Berlin, and denominated "Ich Muss." In this case, the platinum pill and wire were in the axis of the burner, and only a few millimetres from its mouth; being mounted in a suitable manner in place of the conical disc at the top of an ordinary Welsbach burner. In this position, they are stated to escape injurious heating from the flame, while igniting the gas as soon as the tap is turned on. In this, and all cases where the familiar platinum black and wire are employed, everything depends on the black continuing active; whereas it is well known that dust and soot rapidly impair its activity. Hence it is necessary to bear in mind that the pill of platinum black must be renewed at intervals. Pills for renewal, indeed, cost only about 6d.; but the liability to failure after lapse of time must ever constitute a source of uncertainty—and, indeed, of danger—with all these platinum devices. Danger, of course, need only be contemplated when they are relied upon for the self-lighting of distant burners, from which the escaping gas—in the event of their failure—might not be detected before it had formed an explosive atmosphere in the vicinity. Herr Becker also showed an incandescent burner nozzle, which was stated to give a light of 179-candle power (English) for a consumption of 6·9 cubic feet of gas per hour. An electrical distant burner-lighter was shown by Herr Schultze, of Vienna.

We have now referred to the more noteworthy exhibits in connection with incandescent gas lighting. But it would be wrong to omit some reference to the predominance of this system of lighting throughout Vienna. During a stay of seven days in the city, we observed flat-flame gas-burners in use only at one place, where they were evidently being employed intentionally as an aid to ventilation. The street lighting is wholly by means of incandescent burners, generally one, but often two, in each lantern. The mantles and chimneys are fitted to the upper half of the burners, which are of the "C" type, at the Vienna works of the Austrian Welsbach Company; and the upper half of the burner is exchanged for one fresh from the works when it is necessary to renew the mantle. The result is that, as the mantles are carefully aligned at the factory by a special staff accustomed to the work, they are always set up vertically in the lantern, and mantles which are incandescent on one-half or side only are practically never seen in Vienna. This system of distributing mantles for local use ready mounted on a stiff and fixed prop on the burner appears to be attended with a much higher general efficiency of the street lighting. The Kern type of burner seemed to be comparatively rare. Electricity is not at present used for street lighting in Vienna, and is found only in some theatres, hotels, restaurants, and a few private houses. When the municipal electricity supply works, now under construction, are completed, there may be a more extended use of electric lighting; but it is hard to believe that it will displace many incandescent gas-burners. The existing flat-flame gas-burners may, figuratively speaking, be counted on the fingers; and their displacement by electric lamps would pass unnoticed.

Next week we shall deal with the remaining exhibits of note.

## A NEW VIEW OF THE HOUSING OF THE POOR, AND MUNICIPAL TRADING.

**[Second Article.]**

Our first article on this subject ended at the point where one had to consider the expediency of providing housing for the poor of towns in central localities under uneconomical conditions—that is to say, for rents which do not defray the immediate costs of the accommodation. This is often the case with the improved dwellings provided by local authorities in substitution for insanitary property cleared away under the Public Health Acts, or as a part of schemes for the improvement of selected areas, if the new shelters are to be occupied by anything approaching the same class of tenants as those displaced. Here is the great difficulty of all such rehousing schemes. As a rule, the clearing of an insanitary or otherwise condemned area merely drives the old occupiers into adjoining houses too crowded before; and when the new buildings are erected, they are too highly rented for the original population. Consequently, every clearance intensifies the evil ot overcrowding in the neighbourhood. The new buildings rarely or never accommodate so many inmates as those destroyed to make room for them; and they are not the same people. In the circumstances, it is not to be wondered at that local authorities should be discouraged, and stay their otherwise willing hands from further slum-clearing; or that magistrates should hesitate to condemn bad houses, for the reason that, after all, poor accommodation is better than none.

It should not be lost sight of that what is an uneconomical building operation on the part of a local authority, having regard only to the immediate financial result, may nevertheless be really profitable to the community when all the collateral benefits are taken into account. The suppression of a sink of physical and moral filth (the accumulation perhaps of centuries) must be a gain which cannot be valued in money. This is an important part of the duty of local sanitary authorities, to which they are called to put their hands without fear for other consequences. In these instances, it is not desirable that the old population should be brought together again, upon the cleansed and disinfected spot. But it is desirable that, where it has been deemed expedient to rebuild for a poor population, the rents should be adjusted to the standard of what the people will pay without resorting to pernicious overcrowding, not by what the whole scheme cost to carry out. The difference must be borne by the community, for the sake of the principle enunciated in our previous article. The scale of these sanitary operations must be set by the local requirements and the extent of the resources of the community which has to bear part of the cost.

If sanitary clearings and every kind of street industrial and railway enlargement had to be burdened with the condition of rehousing on the spot an equivalent number of persons of the labouring class to those displaced by such operations, every improvement of the kind would be brought to a standstill. It has pretty nearly come to that now, in respect to railway extensions in Metropolitan districts. Happily, there is a way out of the difficulty, which far-sighted local authorities are just beginning to perceive, although it has not yet been opened up for extensive use. The track starts from the query, To what extent is it desirable to keep a labouring-class population planted in town areas? All the signs of the times indicate that the necessity, such as it is, is a dwindling one. As to the actual extent of it, there is a conflict of opinion. For many years the Corporation of the City of London viewed with alarm the progress of the depopulation of the City, as a residential area, which is now a realized fact. Among other precautions thought to be necessary for the security of the City after nightfall, was the obligation laid upon the members of the City Police to live within the walls. This requirement gradually became such a hardship for the men, that it has been greatly relaxed, especially for married members of the force.

The example of the City Police in this connection is typical. With regard to the labouring class in general, it is argued that those who work in certain trades, and pursue other less defined occupations incidental to the life of a great town, must live near their work. But the matter is clearing itself up. Every year many manufacturers who employ numerous hands shut up their town factories, which are commonly converted into warehouses and offices, and carry their works into the country. All the

heavy industries that once had a home in London, and many of those that occupied the very heart of large provincial towns, have been moved out. The high price of land at these centres of commerce and industry forbids its continued use for businesses requiring much elbow-room and a great number of inferior workers. The ground occupied here by a workman is too costly in proportion to his profit-earning value. So he has to be employed elsewhere; and the highly salaried negotiator or administrator takes his place.

So the essentially town labourer tends to ultimate extinction; and in the meantime he deteriorates in social standing. Fewer of him are really needed; and he grows more "casual" every day. The housing of him and his becomes a subject in which the police are almost as deeply interested as the sanitary authority. At any rate, the conviction grows upon the mind of the candid observer that the execution of great works of street and railway improvement ought not to be hampered by excessive regard for the assumed claims of the town labourer to the freehold of his accustomed purlieus. There is less need year by year for the preservation of poor residential neighbourhoods in great towns; while, on the other hand, there is a great and growing demand for the enlargement, improvement, and acceleration of every means of getting into and out of towns, and of circulating within their limits, in the interest of every order of the community.

Let us pause here, in the current of the argument, to note the curious apparent conflict of a centripetal with the centrifugal tendency of English town populations. Concurrently with the enormous expansion of suburban life, entailing the daily inflow to and return from the centre of a vast flood of humanity, there asserts itself a distinct set of the population to the centre itself. This is most marked in London, where the modern fashion of "flat" dwellings has in recent years counteracted in some degree the suburban exodus—only within a small and distinctly limited range of applicability, however, as it is easy to show. Speaking broadly, the whole order of "flat" dwellers in London, rich and poor, properly consists of those who might almost be classified as "lodgers." Not altogether, of course, because a "flat" is an independent domicile in a sense to which lodgings, or "chambers," do not pretend. But still, taken all round, the dwellers in flats are those who, if they belonged to another class, would describe themselves as having "no encumbrances." This being so, they cannot amount to more than a mere fringe on the great bulk of the domestic population which goes to town to work, and has homes outside—often far away.

Well, now, what does all this discussion lead to? It points, in the first place, to the not very startling, but yet important, observation that, before they talk too glibly about the Housing Question, it behoves the public who are interested in local government affairs to make sure that they understand what it means. Otherwise, members of local authorities and the ratepayers whom they are supposed to represent, may find themselves drifting into doubtful municipal building adventures of which no man could predict the end. The initial objections to municipal housing enterprises are such that all schemes of the kind require the closest examination on the question of expediency. Building for picked tenants is not a solution of the most difficult of the many problems covered by the Housing Question—the provision of healthy dwellings for the very poor, those whose whole life is a struggle to keep out of the Workhouse as long as possible. The London County Council, the Metropolitan boroughs, and other municipal authorities who have tried their hands at the work, have confessed that they cannot touch this class of tenantry. In these circumstances, therefore, it behoves these experimenters with the ratepayers' money to speak very modestly and diffidently of their past exploits in this line. And private enterprise beats the public authorities easily in providing accommodation for the picked tenantry upon whom they both depend for a return on their building investments, under similar conditions.

Therefore, the free extension in this direction of municipal enterprise, is neither necessary nor desirable. Unless rigidly kept within bounds, it would discourage private operations in the same field; while the limitations set to municipal borrowing would effectually prevent any local authority from becoming the sole house builders of their district. Many millions of money would be required for carrying out a "spirited housing policy." There could be no guarantee that the money would be well spent. Then there is the political danger to be faced, which, in the minds of many thoughtful citizens, overshadows all the rest. "If, as is proposed, the housing industry is cut adrift from the market, and entrusted as a public service to popularly elected bodies, such as County and Borough Councils, their procedure will draw a continuous running fire of agitation, not only from their employees, but from their tenants. It has been suggested by the Town Clerk of Birmingham (himself an ardent advocate of Municipal enterprise) that municipal employees should be disqualified as voters. This seems a reasonable suggestion; but it would be impossible to deprive municipal tenants of a vote. Already, we are informed, in certain provincial towns where the municipality have entered into the building trade, the risk of corruption appears so formidable that public opinion strongly favours a transfer of the municipal houses to a non-political trust. Even with this safeguard, it is not easy to see how the danger of corruption is to be avoided."

If this goes on to a much larger extent, the danger will be in the thrusting out of the business element in municipal house supply, and its replacement by a disreputable mixture of politics and charity. The temptation to curry favour with the voters will be more than candidates for election to the local authority will be able to resist. Responsible landlords, seeing how matters were going, would get rid of their property, which would fall into the hands of small and unscrupulous holders. Agitation for buying these men out would arise everywhere, with the result that the municipality would purchase depreciated property and be compelled to put it into habitable repair. Other house property would be attacked, whenever and wherever the local authority wished to get possession of it, by the same old plan that has so often been employed in regard to gas and water undertakings upon which the local authority had cast covetous eyes—vilification, and injury aimed at the depreciation of the value,

It follows from all this that what local authorities can do, and ought to do, directly by way of tackling the Housing Question—apart from setting in action Part III. of the Act of 1890—is very little, in ordinary circumstances. There is, however, an alternative which we shall discuss in another article. It is indicated by a few words exchanged in Committee on the London Tube Railways, between a member of the Joint Committee and Mr. Cripps, the Parliamentary Agent for the London County Council.

## THE BRITISH IRON TRADE ASSOCIATION.

### Foreign Competition—Standardization of Sections.

In view of the very direct influence that the condition of the iron and steel trades has upon the coal market, and of the altogether abnormal circumstances existing last year in both the iron and coal industries, the annual report recently presented by the Board of Management to the British Iron Trade Association upon the events of the past year, is a more than usually interesting one, especially, perhaps, in its references to American and other foreign competition. Comments on the past, and possible future, effect of competition occupy, in fact, the main portion of the report.

In submitting their report for 1898, the Board of Management observed that that year had been unsatisfactory "because we have experienced a greater intensity of foreign competition than we have ever known before"—an intensity very considerably increased, it may be noted, in consequence of the great labour dispute in the engineering trade. In their report for 1899, the Board observed that, despite foreign competition, that year had been the best that the iron trade had known for quite a quarter-of-a-century; the amount of business done having been phenomenally large, and prices having been higher all round. But in their latest report—that in respect of the year 1900—the Board "have reason to speak of foreign competition as more formidable than it had been in either of the two previous years." This fact is clearly demonstrated by the statistics given relating to the imports of the different descriptions of iron and steel into the United Kingdom during the last three years. These particulars show that the total of the imports, which rose from 615,302 tons in 1898 to 664,986 tons in 1899, reached the record figure in 1900 of 792,578 tons—showing an increase of about 18 per cent. over 1899, and of 27 per cent. over 1898. This remarkable, and indeed unprecedented, increase of imported iron and steel—which, it may be noted, has been more than maintained during the current year—was mainly due, say the Board, "to the aggressive developments of the foreign trade of the United States. From that country our imports under three heads have increased enormously in the five years ended 1900, as the following figures show: Pig iron imported from the United States: 1896, 17,417 tons; 1900, 94,282 tons. Unwrought steel: 1896, 1974 tons; 1900, 157,851 tons. Iron and steel manufactures: 1896, 27,382 tons; 1900, 69,958 tons"—an aggregate importation of 322,091 tons last year, as compared with only 46,773 tons in 1896.

This increase of foreign competition the Board of Management do not affect (as some writers in the trade journals have affected) to treat as of little importance—an inconsiderable trifle. The report speaks of the "imminent prospect" of the competition continuing on an increasing scale, and states that "the subject has not escaped the attention of the Board, which has had it repeatedly under consideration, and has given much thought to the difficult problem of how an organization like the British Iron Trade Association could most effectually undertake to deal with the problems involved." That is certainly the spirit in which our manufacturers should approach the question of foreign competition; and we are glad to read that, in view of the fact that "American competition has now become so important a factor in relation to the future of the British iron trade," the Association have determined that the time has come when the whole matter should be investigated in the interests of the trade generally. It has therefore been decided that an investigation shall be made "under more judicial, comprehensive, and, as far as possible, expert conditions than any so far available to the members and the trade as a whole."

Those of us who have seen the far-reaching importance of the possibilities of increased competition of American goods with British in our own, as well as in foreign, markets—the effects of which would not be by any means confined to the trades directly concerned—and have discussed the subject at some length, will heartily welcome the report of the investigators to be appointed by the Iron Association. At the same time, our withers are quite unwrung by the remonstrances directed in the report to those

who have done their best to call public attention to the question. We are told that "it is likely to be a source of great discouragement to British manufacturers to have their resources and capabilities unfavourably contrasted with those of their rivals, whether fairly or otherwise." But if the unfavourable contrast exhibited be a fair one, surely it is far better that the British manufacturer should suffer temporary "discouragement," through his errors being pointed out to him, than that he should suffer eventual and permanent ruin through his disregard or ignorance of those errors. If we meet a pedestrian who inquires how far he is from his destination, and perceive that he is walking away from, instead of towards, the place he names, we undoubtedly considerably discourage that pedestrian by telling him he has to retrace his steps five miles (say), and start on a new track; but it would even more certainly be a stupid and mischievous thing to leave him in ignorance of his blunder in order to save him the temporary discouragement involved in his correction. Nothing but good can accrue to the iron trade and every other trade in this country, we are assured, from the wide publicity given by writers and speakers to the need for our manufacturers putting themselves in the best possible position to meet the competition that has already come into being, and that which they will have to face in future.

The report, as a further reason why so much attention should not be drawn to the deficiencies of our manufacturers, remarks that our foreign customers may very possibly be unfavourably influenced by comparisons, adverse to the British manufacturer, drawn between our methods and those of our rivals, in speeches or articles printed in this country. That plea for silence seems to us very thin. If the hold our makers of iron and steel goods have upon their markets were so slender as to be seriously and permanently affected by such criticisms upon their methods of manufacture or management as have been published of late, the outlook for those industries would indeed be dark. We certainly are of opinion that any slight hindrance that such criticisms may temporarily place in the way of our progress in foreign markets will be enormously outweighed by the ultimate advantage accruing from the fuller recognition, by those most directly concerned, of the difficulties that lie before them, of the extent to which those difficulties are enhanced by antiquated methods and machinery, and of the necessity of bestirring themselves if they are not to "go to the wall." We have always argued that the British manufacturer will in the end be found very near the front, but that he will have to go through some trying experiences before he and his employees have learned the lessons that must be mastered to enable him to succeed in the fight.

Meanwhile, we learn from the Association's report, steps have been, or rather are being, taken to remove one of the handicaps upon the British manufacturer to which attention has often been drawn. At last year's conference of the Association, a paper was read in which the expediency and advantage of reducing the number of sections manufactured in the steel works of this country were insisted upon; and a resolution was adopted in favour of bringing the matter under the consideration of the various engineering and kindred societies, with a view to their co-operation being secured in the effort to reduce the existing multiplicity of sections. The Association learned that in the steel works of Great Britain there are nearly five times the number of sections of angles, tees, joists, zeds, &c., rolled that there are in the leading steel works of the United States. To keep so large a number of sections on the section books of steel manufacturing firms naturally involves the expenditure of a great deal of capital, and the enhancement of the cost of production.

Inquiries have elicited the fact that the adoption of standard sections would be hailed with general satisfaction; and the movement in favour of such adoption has been strengthened by the appointment of a Committee of the Institution of Civil Engineers to deal with the whole question. With them will co-operate a Special Committee of the Iron Trade Association; and "there is every reason to believe that the joint exertions of the Committees will result in a very material reduction of the number of sections in use in the British steel works." "An eminently desirable consummation" will be the opinion of engineers in all professions, and one which will assist us in our competition with America and Germany, who use many less sections than ourselves.

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**Arsenic in Coke.**—In the course of the proceedings at a further sitting of the Royal Commission on Arsenic in Beer and Food, Mr. H. Stopes, maltsters' architect and engineer, and member of the Council of the Central and Associated Chambers of Agriculture, expressed the opinion that the quantity of arsenic in coal, coke, charcoal, or other fuel, was small, and that the proportion which would get into malt would therefore be negligible.

**British Association of Water-Works Engineers.**—The annual meeting of this Association will be held at Birkenhead during the second week in July. The programme (as will have been seen by the notice in our "Water Affairs" on the 18th ult.) presages an interesting meeting which will well compensate the visitor. The Council and the Secretary (Mr. Percy Griffith) are anxious to make it successful also in point of attendance; and therefore any members who have not already done so will assist the Secretary by at once applying for tickets. Water engineers who are not members, but who would like to take part in the meeting, are also requested to communicate with Mr. Griffith at 54, Parliament Street, S.W.

## ELECTRIC LIGHTING MEMORANDA.

### The "Money Matters" of Municipal Electricity Suppliers—The Question of Loan Redemption—The Load Factor.

THE members of the Municipal Electrical Association have had a meeting in Glasgow under the presidency of Mr. W. A. Chamen, the Electrical Engineer to the Corporation. The Presidential Address was chiefly devoted to what the "Electrical Review" pertinently classifies as "Money Matters," admitting at the same time that local authorities everywhere who have gone in for electric lighting are "feeling the pinch." By much unpleasant experience, these local authorities have learnt that the business of electricity supply does not pay, on the whole; and that in particular new plants, and mains extensions, do not even pay expenses for years. They have usually learnt this lesson independently of the eminent consulting engineers who originally designed their works and advised them as to the carrying out of their Provisional Orders. These gentlemen, to put it mildly, never laboured that point in their reports, but left its importance to be measured up by their clients' own Resident Electricians. It is men like Mr. Chamen and his colleagues of the Municipal Electrical Association who have to bear the burden. Electric lighting loans and their interest and sinking fund charges are born together. The instant the money is taken up, these payments must be provided for. Now it is evident that the money cannot be productive while the works upon which it is spent are in course of construction, nor for some time afterwards. Mr. Chamen therefore protests that it is unreasonable to charge these loans with their sinking fund payments from the start. The Council of the Association are studying the question, and may later on frame a recommendation.

The subject is full of difficulty. In a sense, electric lighting loans are no different from other municipal indebtedness, in the requirement that they must bear interest and redemption charges from the first. The advances are secured upon the local rates, and the borrowers know perfectly well the conditions under which they will alone be made. In the case of unremunerative capital expenditure, as for channelling, there is no hardship in beginning the repayment of the loan at once. It has to be paid, and the more numerous the instalments the lighter they fall upon the rate-fund. On the other hand, where the loan is for a surely paying business, as the gas undertaking, it is equally a matter of indifference when the process of repayment begins, because there is always plenty of cash in the till available for the purpose. The real pinch, in the case of electric light loans, is that whereas they may never be remunerative, or not for many years, the borrowers persist in shutting their eyes to this fact, and make believe that the business either is, or is soon going to be, profitable. Local authorities plunge into debt for electric lighting with a light heart, because they invariably believe it is going to pay—if not in the first year, certainly in the second. We have files of consulting electricians' reports to this effect; while those who are differently inspired could be counted on the fingers of one hand.

Well, then, the original loan is taken up, and the works started. It is not long before extensions are called for; and the alderman in charge rubs his hands with satisfaction on this proof of the flourishing state of the corporation venture. Additional mains are run everywhere, and fresh loans have to be taken up. After awhile, although the extensions still go on, the margin of profit on the revenue account shows an ominous tendency to shrink. What is happening is that the extensions are susceptible of being called by another name. They mean an open capital account. In the desperate endeavour to find full work for the central station, distant connections are sought for—only to make the finances of the undertaking worse. The load-factor remains as unsatisfactory as before. Presently, the central station arrives at the happy state of having 30 per cent. more lamps in circuit than its generating plant can feed at once. After struggling for a time with this condition, the hour arrives when all the consumers really do want light all together; and then there is a breakdown, and a call for more loans—this time for the central plant.

This appears to be the experience of Manchester; and from something Mr. Chamen said, it is not an unknown condition even in Glasgow. The open capital account is the bugbear. There seems to be no easy way of arriving at a balance, so that fresh expenditure shall be really and truly reproductive. What is the reason of this? The electrician says it is the poor load-factor of the plant. If he has to send out only 8 or 9 per cent. of the total capacity of his machinery, it is useless to him to double his connections. His commercial colleagues may scour the district far and wide for customers; but if they are all of the same sort, they do not improve the look of the revenue account, while they are ruinous in capital. What is the good of a growing business if the working expenses grow also, and the capital runs away faster still? So thinks the commercial man; and this is also the justification for keeping municipal borrowers sharply up to time with their interest and redemption payments. Practically, it would be useless to give them time. They are like any other impecunious borrower in the hands of money-lenders. They can as well pay now, as ever they will be able to pay. There is no similarity between the case of electric light loans and loans for heavy water-works extensions, the sinking funds for which are frequently deferred over the period of construction. In Mr. Chamen's words, the commercial man, confronted with the state of affairs described, goes off grumbling that "the electric lighting is a poor business;" and, as the French say, "he has reason."

## SIMPLE GENERATION OF ACETYLENE AND ITS PURITY.

From the day when Professor Vivian B. Lewes, at the Society of Arts, first awakened interest in acetylene gas, we have kept the readers of the "Journal" informed as to its progress—regarding it as a ready means, given suitable apparatus, of fulfilling a useful service in places where coal gas is not available. Observation of the several forms of generating appliances which have been introduced, and following the investigations of qualified experimenters, have convinced us that the simpler the apparatus—due regard being had to quality and suitability of construction—the better for the user. Not only is less attention required, and not only is there less excuse for an exorbitant charge for the apparatus, but the resulting product from the carbide used in the simple and properly constructed vessel is of a far purer character than is obtained from many generators containing showy but trifling appurtenances. In the past our "Register of Patents" has recorded perhaps a hundred-and-one contrivances for the automatic generation of acetylene gas; and doubtless by this time, had we been content to continue devoting space to their publication, we might have been able to have written a thousand-and-one. Some have shown ingenuity in their design; others have been frivolous. But all these automatic arrangements were merely fabrications which secured in a more or less indifferent way the end already achieved by apparatus unencumbered by such strange devices. In some cases, the object of the "invention" may have been the perfectly justifiable one of trying to find a means of producing acetylene in a manner which would not infringe existing patent rights; others may have been devised for the sole purpose of producing something sufficiently attractive for the company promoter and the unwary investor; and a few may have been—we will generously admit they were—the issue from the belief of the inventor that it was in the direction of automatic production that advance would have to be made. But whatever the objects of the devisers, whether it was for a good or for a selfish purpose, their ideas must all fall before present-day knowledge.

Less than eighteen months ago, Professor Lewes wrote: "In the near future, it will be recognized that all forms of automatic generators have their drawbacks; and the generator of the future will be of the greatest simplicity." To-day, we find, among the foremost of scientific investigators in the subject, the opinion is held that the simple projection of carbide of calcium into a large volume of water produces the purest of acetylene. This is the lesson of the valuable and instructive address delivered by Herren A. Rossel and E. Landriset at the inauguration of the Swiss Carbide and Acetylene Association at Berne, a summary of which was published in the "Journal" for the 11th ult. Ammonia and sulphuretted hydrogen are two of the impurities of acetylene; and Herren Rossel and Landriset say: "The amount of ammonia may even be reduced to *nil* if the acetylene is generated by projecting carbide into water." Again: "The sulphur compounds are more detrimental to the illuminating power of the gas than is ammonia . . . When carbide is projected into a large volume of water no trace of sulphuretted hydrogen results; but when water is dropped on to carbide, a great part of the sulphur present escapes as sulphuretted hydrogen and other compounds."

Our translation of this address attracted the notice of Mr. E. W. Lancaster, Assoc.M.Inst.C.E., of Husson's Safety Acetylene Syndicate; and he invited us to a private demonstration of the working of the Husson plant, in order to show that in every particular it meets the requirement of simplicity and the conditions laid down by Herren Rossel and Landriset for the production of gas of unquestionable character in regard to purity. We were first shown an experimental plant; and then a set of proportions ample for the lighting of a small village or a large establishment. To the latter, attention may be confined. The generator (which is 36 inches in diameter) is circular, with a bottom of the shape of an inverted cone. The feeding aperture is at the top. The carbide of calcium is simply dropped into the inlet by hand, and falls down an arrangement of inclined planes to the extreme of the conical bottom. The generator is filled with water; and it was proved by the application of a light that the arrangement of inclined planes prevents the emission of gas from the feeding aperture—its only outlet from the generator being by way of the pipe leading to the gasholder. Now immediately the carbide touches the water, lime begins to form simultaneously with the gas; and this lime is kept in a state of suspension during the whole time gas is being generated—in fact, after the producing action commences, the water appears to be almost of the consistency of milk. This lime water plays an active part in the purification of the gas in its passage from the bottom of the generator to the top, as is evidenced by the address already alluded to. It was demonstrated by submerging a piece of calcium carbide in a glass filled with water, that the gas as generated sets up a whirling action, and keeps the lime water in a constant state of agitation, so that there is no subsidence of the lime until after generation ceases. The gas is thus thoroughly washed and cooled in the generator itself owing to the largeness of the volume of the lime water it passes through in its escape to the outlet. The cooling is amply proved by the temperature of the pipe conducting the gas to the holder.

The holder in this particular plant is constructed to contain 500 cubic feet. The bell works in a water-sealed tank; and is furnished with wheels and guides for maintaining its position and steady operation. On the outlet of the holder, any impurity or residue is removed by the passage of the gas through a small cylindrical purifier, whose principal content is a mixture of earth and chloride of lime. Before the holder was emptied for this special demonstration, it had been standing full for some four or five days without the slightest drop of the bell. The holder is made to give a 3-inch pressure; and this ensures a constant pressure at the burners, which Herren Rossel and Landriset show is so very desirable to secure uniformity of illumination. Three inches pressure, too, comes within the limits they prescribe. The position of the bell when recharging is an index to the quantity of carbide which will be required for replenishing the holder.

Before the generator is recharged, the lime sludge which has deposited at the extreme of the conical bottom is removed by opening a large tap situated there; the weight of the water above forcing the sludge out. Compensation is then made at the top of the generator for the water so lost; and the process of generation can then be repeated. The whole operation from the cleansing of the generator to the filling of the holder, it was proved, occupies less than half an hour. At the present price of carbide, Mr. Lancaster reckons the cost of the acetylene, light for light, is equivalent to 3s. per 1000 cubic feet of coal gas.

The plant has been adopted for the lighting of many private places in the country; but as we are only concerned in the apparatus from the technical point of view, we need not cite the examples to which attention was directed. Interested readers can make their own inquiries. Speaking generally it may be said that Mr. Lancaster satisfied us that the Husson plant does possess what are, on the best authority, the necessary qualifications of a good producer of acetylene gas. Before leaving, he also brought to notice some boiling-rings adapted for acetylene gas; and he hopes to soon introduce acetylene-gas appliances suitable for roasting and grilling. In the case of the boiling-rings, each jet consumes $\frac{1}{10}$ cubic foot per hour; and the number of jets in each ring ranges from twelve upwards.

## THE GAS AND WATER STOCK MARKET.

**(For Stock and Share List, see p. 47.)**

The Stock Exchange had anything but a bright week to close the first half of 1901. Business was very quiet, and the tendency in general was flat all round. For this, various disagreeable incidents were mainly responsible—such as a suspension of foreign banks, internal troubles in some large and important undertakings, &c. Happily, the tone at the finish was rather better. Still, prices in almost all departments have undergone some shrinkage. In the Money Market, there was a strong demand in connection with the Stock Exchange Settlement, and with the requirements of the period rather stiff rates were exacted from borrowers; but discount rates were unchanged. Business in the Gas Market was on a very limited scale; some days being almost blank. Now and then there might be a feeble indication of some reviving animation; but it soon died away again. The tendency may be written as steady; for changes in quotation were limited to two in number, apart from those which were adjustments to the deduction of the dividend. In Gaslight issues, there was a little quiet business in the ordinary at level middle figures; but just at the finish there was a sign of improvement, and the closing prices were the best of the week. The secured issues were hardly touched. In South Metropolitan there was perhaps as much done as in anything; but the price was rather shifty, veering abruptly from 124 to 126, and then back again. A few bargains in Commercials were marked at middle prices; the quotation not having changed yet in response to the reduction in the price of gas. One or two transactions in the Suburban and Provincial group were recorded; but nothing moved except Alliance and Dublin, and in that there was no business done. The Continental Companies were very quiet. Imperial was steady; but Union appeared disposed to fall, although the quotation was left standing. Among the remoter undertakings, Melbourne bonds were stronger; and the debentures of Buenos Ayres and River Plate were a point better *ex div.* In the Water Companies, business was on its usual restricted scale; and transactions scarcely afforded any indication of a tendency. New River was lowered to a moderate extent; and Lambeth $7\frac{1}{2}$ per cent. lost on *ex div.* adjustment.

The daily operations were: Gas opened very quiet on Monday, and prices did not move. Tuesday was a shade brisker, but still without any change in quotations. Wednesday was extremely inactive. Alliance and Dublin fell $\frac{1}{2}$. In Water, New River receded 3. Thursday was quiet and unchanged. Friday was as dull as any day of the week. Melbourne $4\frac{1}{2}$ per cent. bonds rose 1. Saturday closed without any further variation.

We learn from the "Standard" that Sir J. Blundell Maple has prepared a Bill dealing comprehensively with the Metropolitan Water Question. The provisions of the measure have, it is understood, received the favourable consideration of several members of the Cabinet; and the Bill is likely to find its way, in a few days, into the hands of members specially interested in the question.

## GAS AND COAL-DUST FIRING.

In the course of the past few years, great advances have been made in the utilization of coal dust and refuse for the production of motive force. Economy of fuel is the aim of the conductors of every large industrial undertaking in which power is employed to any considerable extent; and this fact invests with interest a little work by the late Albert Pütsch, bearing the above title, of which a translation has lately been prepared by Mr. Charles Salter.* The object of the author in writing the work was to complete his preceding treatises on the same subject, published in 1880 and 1887. In the earlier volumes, he investigated the patents granted up to 1885 in respect of systems of gaseous firing and smoke-consuming devices; and he has now criticized, in the light of his personal experience, those which have since appeared. He was assisted in the selection and preparation of the materials for the work by Herr Carl Süreth, who made the drawings and undertook the task of seeing the volume through the press.

The author deals first with generators. He explains at the outset that there is nothing specially novel in principle to be recorded with regard to them, as, a certain depth or height of the mass of fuel being essential to the production of gas, the makers are more or less restricted to the well-known shaft type; the fuel being consumed on flat, sloping, or stepped grates, or even without any grating whatever, and under natural or forced draught. He then goes on to describe the various forms of generator, including those of Hans Neumann, Franz Zahn, and Friedrich Siemens. These appliances were principally designed to produce heating gases by the aid of atmospheric air; and therefore the author next turns his attention to generators employing steam as the chief producing agent, and only using air in the proportion necessary to raise the fuel to the requisite high temperature—in short, water-gas generators. These are all, as is well known, based upon the fundamental idea of raising fuel to a white heat by an air-blast, the supply of which is then cut off and replaced by steam, which is passed through the glowing fuel, whereby permanent gases of high calorific value are formed. One of the defects of the process was the loss of the heat contained in the gases issuing from the generator. This difficulty it was the endeavour of Haltzer and Rateau to overcome by their device, which is described, as are other generators. The author next gives particulars of stirring and feed-regulating appliances, and then comes to direct generators.

Having dealt with the production of heating gases and the generators relating thereto, the arrangements concerned with the commingling of the gases and atmospheric air in order to produce a flame—in other words, the "burners"—are considered. The devices of Siemens, Liegel, and others are dealt with successively; and then we come to the subject of recuperation. The principle of regeneration—or, as the author puts it, "the endeavour to recover and utilize upon the spot heat that would otherwise be wasted"—finds expression in a whole series of patents. As the construction of the arrangements for this purpose depends closely upon the object for which the system of firing is designed, the author considers in detail the various members of this class of gas-furnace, and then passes on to deal with glass-smelting, metallurgical, and pottery furnaces.

The last subject to be discussed is that of coal-dust firing, which, as the author points out, is specially interesting, inasmuch as, in many respects, it exhibits certain analogies to gaseous firing. The idea of utilizing coal dust in this way occurred to Henschel as long ago as 1831; and it was taken up afresh by Crampton in 1872. The principle involved is described as "simplicity itself." Nevertheless, its practical application is bound up with numerous preliminary essentials; the chief of them being the task of distributing the coal dust uniformly into the air current. Two methods have been employed with the view of effecting this object—one consisting in allowing the air current to act directly on the dust, whirl it up, and convey it into the fire-box; the other, in the introduction of the dust into the current by the aid of special mechanical appliances. The first system is embodied by only a few forms of apparatus in the German patent list; the bulk of them relating to the second. Both are duly examined; and then the author brings his work to a close. He considers that the employment of coal dust as fuel, especially for boilers, is merely a question of time; but he points out that, however advantageous any given system of firing may be, its introduction into general use only becomes possible when the corresponding fuel is available in sufficient quantity. At present, this condition is not fulfilled by coal dust; the supply being still too small for it to be regarded, even approximately, as an article of commerce. But he says experience has demonstrated that "the cost of converting lump coal into dust is more than counterbalanced by the advantages afforded by the dust fuel."

The conclusion come to by the author is that no important novel ideas have lately appeared in connection with the subject of gas firing, but only in the domain of dust firing. The system, in his opinion, is becoming a very dangerous competitor of gas as a source of heat for industrial purposes. The justness or otherwise of his opinion will be best appreciated after a perusal of his work.

* "Gas and Coal Dust Firing." A Critical Review of the Various Appliances Patented in Germany for this Purpose since 1885. By Albert Pütsch; translated by Charles Salter. With 103 Illustrations. London: Scott, Greenwood, and Co.; 1901.

## PERSONAL.

Mr. J. E. Roper has relinquished the position of Manager of the Great Berkhamsted Gas-Works, and been succeeded by Mr. Henry Whittell.

Out of about thirty applicants, Mr. A. H. Heathcote has been selected for the position of Manager of the Cleator Moor Gas-Works, in succession to Mr. J. A. Gray.

The management of the Lydney Gas-Works has passed into the hands of Mr. S. R. Williams, who succeeds the late Mr. G. Harward, who was connected with the Company for many years.

The name of Mr. J. H. Lloyd, the Chairman of the Birmingham Corporation Gas Committee, has met with unanimous approval for the office of Lord Mayor for the next municipal year. The formal invitation to Mr. Lloyd is to be made at a private meeting of the Council to-day.

Mr. Joseph T. Broughton, who has served his articles with Mr. Charles Harrison, Manager of the Accrington District Gas and Water Board, has been appointed Manager of the Rainhill Gas and Water Company. Mr. Broughton holds certificates in "Chemistry" and "Gas Manufacture."

Mr. E. C. Herring, who has been with his brother (Mr. W. Ralph Herring, Chief Engineer and Manager of the Edinburgh and Leith Gas-Works), as a pupil for the past few years, has been appointed by the Directors of the Dover Gas Company, Assistant-Engineer, under his father, at the Dover Gas-Works.

The twenty-fifth anniversary of Dr. George Lunge's professorship of chemistry at the Zurich Polytechnic—his "Jubilee," as the "Chemical Trade Journal" calls it—was celebrated on the 15th ult. The festivities commenced with a torchlight procession on the evening of the 14th. The next day, a large party, including many ladies, invited the Professor to a picnic; and later there was a dinner at Männedorf. Professor Gnehm, who, in 1876, was Dr. Lunge's first assistant, gave a short account of the Chemical Department of the Polytechnic. A quarter of a century ago, two professors—Victor Meyer and Emil Kopp—were sufficient; and the course of study extended over four half-years. Now there is a whole staff, and the course occupies seven half-years. He highly extolled Dr. Lunge's work, as did Professor Bamberger, a former colleague. The President of the College Council (Herr Bleuler) acknowledged, in the name of his fellow-members, Dr. Lunge's conscientiousness, and held him up as an example for young men to follow. The Chemical Club presented the Professor with a splendid golden wreath. Dr. Lunge, in reply, gave a sketch of his work at the Polytechnic, and expressed his indebtedness to his colleagues, especially to Professor Gnehm, for their loyal assistance. The proceedings throughout were of a very cordial character.

## OBITUARY.

Another veteran in the gas profession has recently passed away in the person of Mr. William Beken, the Manager of the Cranbrook Gas-Works. His death took place on Wednesday week, at the great age of 80 years. Mr. Beken had enjoyed excellent health until recently, when he failed rapidly, and for two months had been confined to his bed. Mr. Beken was widely and deservedly esteemed and respected.

The death is announced of Alderman Samuel Wright, a well-known Bradford solicitor. Deceased was Solicitor for the North Bierley Gas Company, Limited, and appeared on their behalf at the inquiry which took place in connection with the extension of Bradford, and subsequently negotiated the sale of their undertaking to the Corporation. He was also engaged upon the Elland Gas Bill of this session, and his assiduity aided materially in securing the passing of that measure. He was 58 years of age.

After a trying illness, extending over ten years, Mr. Peter Haines Wilkinson, for many years Secretary and Manager of the Harrogate Gas Company, passed away on Friday, the 21st ult. It is somewhat singular that, since the formation of the Company in 1845, there have been only three Secretaries, all bearing the name of Wilkinson, and yet in no way related. The deceased gentleman was the second, having succeeded Mr. Samuel Wilkinson in the latter part of 1857. At that time the undertaking was only a small one. But it grew as the town developed; and from an annual make of 8 millions in 1860, it reached a production of 110 millions in 1891, when Mr. Wilkinson relinquished the management on account of ill-health. The Directors passed a resolution expressing sympathy with their zealous and faithful servant, and regret at the circumstances which had necessitated the acceptance of his resignation. He was elected a member of the Board, but was never able to attend any of the meetings. He joined the British Association of Gas Managers in 1869, and continued his connection with it as the Gas Institute until 1891. The son of a Wesleyan minister, Mr. Wilkinson was closely associated with that body in Harrogate; and the temperance cause had in him a strong and staunch supporter. He was in his 74th year, and leaves a widow, but no family; his only son having predeceased him. The funeral took place at the Harrogate Cemetery on Tuesday, in the presence of a goodly assemblage of friends and townspeople; the Gas Company being represented by several Directors, the Secretary and General Manager (Mr. H. Wilkinson), the Engineer (Mr. G. S. Sayner), and a large number of the employees.

# NOTES.

### Circulation of Salt.

The ingenious attempt of Professor Joly to deduce the age of the earth from the quantity of salt existing in the ocean has been criticized by Mr. W. Ackroyd, the Public Analyst for Halifax, in a paper read before the Yorkshire Geological and Polytechnic Society. Professor Joly thought that the saline constituents of the ocean are all carried into it from the soil watered by the rivers; but Mr. Ackroyd shows that by far the greater portion of the salt thus conveyed originates in the sea itself. That is to say, salt spray is blown out of the waves of the sea inland, and is washed down by rain. It is so in the upper waters of Airedale, where fully 99·8 per cent. of the salt in the effluent is sea-salt, and less than 0·2 per cent. earth salt. Mr. Ackroyd contends that there is practically no salt in the earth, besides that which is brought down by rain. It is improbable, therefore, that an average of 1 per cent. of the sodium carried to the sea as chlorides, is the result of solvent denudation. Consequently, Professor Joly's figure of 90 millions of years for the age of the earth based on this hypothesis must be altered to 8000 millions of years—a stretch of time likely to surpass the requirements even of the biologists.

### A French Concrete Church.

It is reported in the "Builder" that the first reinforced concrete church has been built in Paris, from the designs of M. de Baudot, an old pupil of Viollet-le-Duc. After the designs and the method of construction of the church, which is to replace the old church of Montmartre, had been duly approved of by the authorities, doubts arose as to the solidity of the building. Work was accordingly stopped for a considerable time, greatly to the annoyance of the vicar of the parish, who energetically moved the authorities to allow the construction to be resumed in the event of certain tests of the materials proving satisfactory. The architect also is a fervent advocate of a rational architecture evolved from a complete and rational use of modern materials. Consequently he is a firm believer in the qualities of the system of reinforced concrete construction known in France as the "Système Cottançin," and was the first to adopt it for church building. The Government tests proved completely satisfactory; the floors of the building, not more than 2 inches thick, sustaining perfectly the official load trial of 125 lbs. per superficial foot. Consequently, the structure was allowed to be finished after the architect's plans. M. de Baudot's house is built the same way.

### Manufacture of Graphite from Anthracite.

One of the uses of the electric power supply from the Niagara Falls is the manufacture of graphite by the Acheson process. Originally, the process was only worked for the production of carbon electrodes for use in electrolytic systems; electrodes of amorphous carbon being objectionable in this regard owing to their rapid disintegration. It was soon found that a great many varieties of graphite could be produced by the Acheson process; and endeavours were made to manufacture graphites as good as, if not better than, the product of the natural mines. The raw material is anthracite coal, which is packed in a fire-brick trough between two carbon electrodes. A core of carbon rods is necessary to start the current in the cold; anthracite being too poor a conductor. When the enormous current is established, the silicon of the coal becomes vaporized and burns; and as this constitutes most of the ash of the coal, very little ash remains in the graphite resulting from this carbonization at the high heat of the electric furnace. The graphitized anthracite, when removed from the furnace, has a strong resemblance to Ceylon graphite, and is said to be equally suitable for the manufacture of crucibles. This noteworthy result of the action of the electric furnace upon anthracite is unattended with any chemical change.

### Hints on Drawing Office Management.

The American Society of Mechanical Engineers, at their recent meeting, discussed systems of drawing office management. According to one plan, every draughtsman is furnished with a sketch-book in which he makes all his notes and calculations; the use of loose papers for the purpose being strictly forbidden. Every entry is headed with a memorandum of the subject and the date. Drawings are made in standard sizes 23 in. by 36 in., or on half, quarter, or eighth sheets. The standard size drawings are kept in drawers, the others in file cases. Every drawing is numbered, so as to indicate both the drawer number and the serial number in the drawer—thus, 7604 means the fourth sheet in drawer 76. All shop drawings liable to repetition are traced and blue-printed. Every drawing has a title, date, scale, and its number stamped in the lower left-hand corner. The name of the drawing consists of two parts in one line, separated by a hyphen. The first part is the generic term; the second is the specific name of the piece or thing. Every dimension is written in figures, so that no scale reading is required. All centre lines are alternate dot and dash, in a fine line. All dimension lines are double dot and dash, with a central space for the written figure, and of such a strength as to show on the blue print more faintly than the lines of the drawing. Detail shop drawings give the pattern number of every casting in plain figures of larger size than the dimension figures; the material of which the parts are made; and an instruction as to the finish of parts which are not left black or rough.

# COMMUNICATED ARTICLES.

## GAS MATTERS IN THE UNITED STATES.

### Illuminating Gas from Coal Tar.

The Society meetings do not seem to hold their own in interest this year, presumably because of the limited number of discussable subjects; but there has been no lack of interesting material obtainable outside. Among these interesting subjects, are two for using residuals. Somebody has discovered, or at any rate says that he has discovered, a way by which some of the "heavier hydrocarbons can be utilized for making gas for purposes of illumination." Experiments have been conducted on a considerable scale; and the results are certainly remarkable.

The theory of the process is much, or quite, as follows: Steam is carried over red or white hot coke in a closed retort, by which means it is converted into carbon monoxide and free hydrogen. Without permitting any cooling (indeed, precautions are taken to keep up the temperature), this gas mixture is carried through a superheated charge of "hydrocarbon refuse"—"for example," says the patent application, "what is commonly called gas tar." The gas tar seems to be in a condition of unstable equilibrium; for, instead of the usual result obtained when it is distilled—a collection of condensable vapours—one finds an extended list of truly gaseous products mixed with, or dissolved in, and by, the hydrogen and carbon monoxide.

The following seem to be facts: If the coal tar was distilled *without* the action of the carbon monoxide and hydrogen, certain (relatively not large) amounts of vapours were obtained which were practically gaseous at the temperature of the room, and which, under pressure with a suitable burner, gave a flame resembling acetylene or the Pintsch light. If this gas was chilled to 0·5° C., drops of a fluid hydrocarbon began to deposit on the tube. This deposit was remarkable in amount, if the gas was compressed, cooled, and then expanded.

For some reason, the source of the "coal tar" was concealed. Assurance was given that it was gas-works refuse; but all information was refused. I also tried to get some for analysis; but no analysis of the tar or of the gaseous vapour obtained by distillation was permitted me. The exact amount of gas permanent at the critical temperature per 100 grammes of coal tar was, however, obtained. Each gramme yielded about 16·8 cubic centimetres. On this basis, 100 grammes should yield 1680 cubic centimetres; and if 100 litres of carbon monoxide and hydrogen were passed through the mixer with this, surely one would expect the result to be the sum. But it was not so—the resulting gas was considerably less than the sum. The obvious suggestion was that some very peculiar chemical transformation had occurred. The visible results were these: An apparently permanent gas, or at least this—the critical temperature had been sent down below zero under normal conditions. The candle power was 60, measured on a consumption of 5 cubic feet.

The exhibition, or rather "private view," was very interesting. But I would have liked it better had I been allowed to make a rigid examination of all the ingredients, and of the final mixture. In my own laboratory, some experiments were made to mix a volatile hydrocarbon with carbon monoxide and hydrogen; but although a number of specimens were tried, no such results were obtained. My results were simply those secured by carburetting purified water gas; and they are in no sense those obtained from this described process. The person who exhibited the apparatus denied being the inventor; and but for the reputation of the man who invited me to see it, I should have suspected a "fake." All the more was I inclined to do this, because a mixture of carbon monoxide and hydrogen with $C_2H_2$ has been tried here.

#### Carburetting Gas at the Burner.

Another curious apparatus for carburetting at the fixture has come to my notice. It is described as "an appliance for invigorating natural or other non-luminous gas." The one which I have seen is marked "Patent pending;" and it is certainly very ingenious. The non-luminous gas is carburetted by passing it through a chamber fitted with a wick, the other end of which is in a cistern containing the hydrocarbon. There is no danger, as there is no air in contact with the fluid, nor with its vapour, until after it leaves the burner. The action is somewhat peculiar. The gas, when lighted, has the characteristic flame of producer or such-like non-luminous gas; but as the fixture gets warm, the flame gradually becomes luminous, and after a few minutes an intense white light is produced. If the flame shows any tendency to smoke, the amount of gas passing is slightly reduced, which at once relieves the difficulty by cooling the fixture, and the correct relation is easily obtained. Probably there will be a few details to be improved on; but it is quite a success now, and one cannot but rejoice to see that a way exists by which the non-luminous gas which serves so well for the mantle can be carburetted into a condition of usefulness for use without the mantle. It must be held in mind that the evaporation of the liquid cools the burner, and thus automatically controls the hydrocarbon supply; so that after the burner has been adjusted, it never needs to be further corrected while the gas pressure remains the same.

From the items which I have sent you from time to time, you can see that, since the Denver meeting turned attention in that

direction, everything needed has been prepared for the great transition which will come before long—the substitution of the non-luminous for the luminous gas; the use of the mantle for illumination where this can be employed; and when it is impracticable, the carburetting of the gas at the burner.

## FURTHER NOTES ON PURIFICATION OF GAS.

By S. Carpenter, of East Ham.

(*Concluded from Vol.* LXXVII., *p.* 1669.*)

The object of the hydraulic main, the dip-pipes, and the condensers is to prevent the gas from returning through the ascension-pipes to the retorts. The dip-pipes should have a seal of tar from 1 inch to 1½ inches deep, so that the gas may pass through the tar, as this is the first stage in the process of condensation and purification. The gas and the tar should not be separated before they reach the condensers. "Condensation" is the reduction of anything to another and denser form, as of a vapour or a gas to a liquid, a liquid to a solid, or the passage of gases or vapours from the aëriform to the liquid state. It is sometimes called the "liquefaction of vapours." It may be due to one of three causes—cooling, compression, or chemical affinity. The first we may count upon for the condensation of the vapours intermixed with the gas when issuing from the hydraulic main, into ammoniacal liquor and tar, by which process the latter is prevented from passing forward to the other apparatus. The condenser also serves to reduce the temperature of the gas to the degree most favourable for depositing its ammonia in the washer or scrubber. If the gas is well washed in tower scrubbers with ammonical liquor and fresh water, the ammonia ($NH_3$) and part of the carbonic acid and sulphuretted hydrogen will be taken out; and the gas which issues from the scrubbers will then be in a good condition to go into the lime and oxide of iron purifier where its remaining impurities, which include bisulphide of carbon, will be removed, as previously explained.

The object of the exhauster is to remove the gas from the retorts as quickly as possible, so as to relieve them from back-pressure. Before the exhauster was introduced, the gas was subject to excessive pressure during the process of carbonization, arising from the action of the different apparatus employed in the manufacture of gas—from the dip-pipes in the hydraulic main, which were sealed by the tar, the resistance to which the gas was subject in passing through the purifiers, or the effect of the weight of the gasholder. After the introduction of the exhauster, the pressure was taken off the retorts, the hydraulic main, and the condensers; and there was no need to counterbalance the gasholders. Instead of pressure, a little vacuum was possible on the condensers and the hydraulic main, the pressure could be reduced by the exhauster, and if there was about an inch of vacuum instead of pressure, the deposit of carbon on the interior of the retorts was much reduced. The position occupied by the exhauster is between the condenser and the scrubber. The outlet of the condenser should be connected to the inlet of the exhauster; and the outlet of the latter to the inlet of the scrubbers. There would then be vacuum on the condenser and pressure on the scrubber. Before exhausters were introduced into gas-works, the evils engendered by back-pressure on the retorts were many. First of all there was a deposition of carbon on the inner surface of the retorts; secondly, a diminished quantity of gas per ton of coals; thirdly, the space occupied by the carbon deposit reduced the capacity of the retorts, and consequently the charge of coal; lastly, the expenses of wear and tear and labour were increased.

For the reasons stated, the exhauster is one of the most important appliances employed in the manufacture of gas; and gas managers should look upon it and the hydraulic main as two of their best friends. The latter acts as a condenser, and to a certain extent also as a purifier, and likewise as a tar-valve, as, the dip-pipes being sealed with tar, the gas is prevented, as already explained, from returning down the ascension-pipes during the time of drawing and charging the retorts. The exhauster does two things at the same time—it exhausts the gas from the retorts as quickly as it is made, and forces it through the purifier to the holder. Before its introduction, the heat of the retort had to do its work. One form of this appliance is called the "steam-jet" exhauster. It is very useful in gas-works, especially for ventilating the lime purifiers, and at the same time revivifying the foul lime before it is taken out. The purifier may then be emptied without fear of creating a nuisance during the operation. When the foul lime is prepared, it can be used a second time for the purification of gas; thus reducing the expense, as less clean lime will be required, and not so much "spent" will have to be disposed of.

In connection with the subject of the purification of gas, it may be useful if I now describe the way in which I worked the sulphur when I commenced experimenting on coal gas for the detection of bisulphide of carbon in the year 1866-7. The rules I laid down were the following: Record the time the gas is lighted up and extinguished, the hours the test is in action, the quantity of gas burnt, the water produced from condensation, the water per cubic foot of gas, the sulphate of barium found in 1000 grains of the liquor tested, and the sulphur in 100 cubic feet of the gas tested. Some of the results are recorded in the following table:—

| Time Lighted. | Time Extinguished. | Hours Burning. | Gas Burnt. | Water Produced. | | Barium sulphate. | Sulphur. |
|---|---|---|---|---|---|---|---|
| May, 1867. | | | Cub. Ft. | (*a*) | (*b*) | (*c*) | (*d*) |
| 9th, 2 p.m. | 10th, 7 a.m. | 17 | 13·0 | 4600 | 360 | 3·8 | 18·40 |
| 19th, 2 p.m. | 20th, 7 a.m. | 17 | 13·0 | 4800 | 377 | 3·2 | 16·52 |
| 20th, 6 a.m. | 21st, 7 a.m. | 23 | 19·0 | 7000 | 370 | 2·6 | 13·32 |
| 23rd, 8 a.m. | 24th, 7 a.m. | 23 | 18·5 | 7000 | 384 | 1·8 | 8·66 |
| 25th, 3 p.m. | 26th, 2 p.m. | 23 | 18·5 | 7100 | 380 | 2·4 | 12·67 |

(*a*) Grains. (*b*) Grains per cubic foot of gas. (*c*) Grains in 1000 grains of the liquid. (*d*) Grains in 100 cubic feet of gas.

In testing the gas for bisulphide of carbon, great care should be taken at the outset that all parts of the apparatus are perfectly clean, and in good working order. Next, the operator should see that the water in the meter is level with the water-line, that all connections are gas-tight, and that the rubber joints of the trumpet-tube and cylinder fit closely. He should guard against draught, which may extinguish the gas-jets. Sufficient sesquicarbonate of ammonia (about 2 oz.) should be placed around the burner, the gas lighted, and the test set to work. With these precautions, and with subsequent careful manipulation of the liquid, the results obtained should be reliable. By noticing the time the test is in action, it will be seen if the gas has been properly burnt; and the operator should see how much gas has been burnt in making the test.

The beaker which receives the condensation water from the cylinder should be graduated in grains and hundredths up to about 10,000 grains. When the meter is shut off, the number of grains of liquor in the beaker should be noticed, and the register of the meter taken, in order to ascertain how many feet of gas have been burnt in the test. A comparison should then be made with the water in the beaker. The condensation from 10 cubic feet of gas in summer will be about 3700 to 3900 grains; but it will depend upon the temperature prevailing while the test is in action. In the summer, when the air is dry and the temperature about 60° Fahr., each cubic foot of gas will produce from 340 to 360 grains; in the winter, it will be from 380 to 400 grains. The object in registering the liquor per cubic foot of gas consumed in the test is to indicate whether or not the gas is properly burnt while the test was in action, as there is a possibility of the gas escaping at the base of the burner. It would happen in this way: The horizontal piece of tube which screws into the base of the burner may leak; and if the gas should escape at that place, it would be registered but not burnt, and the sulphur would then appear very low, and the liquor would be less per cubic foot of gas and of a dark colour, like whisky. The writer has had these troubles when he has been testing gas, so he can point them out for the benefit of others. By measuring the condensation liquor it will be seen at once if the sulphur test is working properly. He has worked the sulphur test in the way described, and can recommend it for keeping the manager well informed as to the condition of his purifiers. If the method which has been described is properly carried out in purifying and testing, there will be no difficulty in removing the impurities from coal gas. The principal object to be sought at the present day is to fully utilize and improve upon the existing process of purification. This can be done, and the process be made to yield satisfactory results with lime, oxide of iron, and atmospheric air. The writer worked for thirty years in the way he has described, and obtained good results.

A few words, in conclusion, on slaking lime. It has been said that lime which is to be used in the purification of gas ought not to be slaked until immediately before being put into the box, as slaked lime absorbs carbonic acid from the air, whereby its beneficial action upon gas is impaired. The writer has not found this to be the case in his experience. The most practical way to slake lime is as follows: Spread it on the floor to a depth of about 6 inches, and then water it. Spread another layer of lime on the top, and water it, and continue adding until the heap is 3 feet high. Allow it to remain for about 24 hours, and then well mix it. Let it get cool before putting it into the purifier; if it remains for a week or two, it will not take any harm by being exposed to the air. Hot, or even warm, lime should not be put into the purifier, as it is liable to cause what are called "blow-holes," through which the gas would pass without being purified. As to exposure of the slaked lime to the atmosphere causing it to absorb therefrom carbonic acid sufficient to impair its action as a gas-purifying material, the process would take years, as the proportion of carbonic acid is generally about 4-100,000ths of the whole volume of the atmosphere. When the lime is prepared for the purifier, it should be soft to the touch, and when squeezed in the hand should adhere. The weight should be from 32 lbs. to 34 lbs. per bushel. Great care should be taken, when slaking lime, not to use too much water; otherwise the lime will cake together, causing back-pressure, and not absorbing the bisulphide of carbon.

The President of the Local Government Board has appointed Major-Gen. H. Darley Crozier, R.E., to be Chief Engineering Inspector of the Board, in the place of Major-Gen. C. Phipps Carey, R.E., who has retired. Mr. G. Waller Willcocks, M.Inst.C.E., will succeed Major-Gen. Crozier as Deputy Chief Engineering Inspector.

* In the author's previous article, the figures at the end of the sixth line under the table should have been 100 (not 1000) cubic feet.—Ed. J.G.L.

# TECHNICAL RECORD.

## THE LARGE GASHOLDER FOR NEWCASTLE.

The construction of a gasholder and tank is not an event of such frequent happening on a gas-works of a moderate sized town that an engineer can keep himself astride of all advances in the details of design and erection which have for their purpose economy in capital outlay and yet the promotion of perfection in ultimate service; and therefore the engineer of such a works finds interest and instruction, when opportunity serves and a suitable example is available, in having the details and some of the principal drawings presented to him for study and examination. Previous to the issue of the "JOURNAL" for June 4, some time has elapsed since we published any detailed information about a new gasholder. In that number, we gave a description and drawings of the last structure of the kind at the Hull station of the British Gaslight Company; and now we have before us the complete specifications and some of the drawings of the holder which is being erected on the site of the St. Anthony's station of the Newcastle and Gateshead Gas Company.

Now if these descriptions and the diagrams are placed side by side with the published information on the subject of not many years ago, it will be seen that, in both their general and minor characteristics, gasholders have not escaped those variations which the building up of experience course by course has produced in most of the serviceable agencies of our daily life. In material, in design, and in magnitude, changes have been made, which, while giving strength and prolonged life, have produced an economy in capital expenditure per unit of effective capacity such as no other part of a gas-works equipment can boast of. Cement concrete tanks are, in most new work, supplanting brick and puddle; and steel tanks have in modern practice the preference over cast-iron ones. In the holders themselves and in the guide-framing, a combination of skill, experience, and—may we not add—a justified boldness has given birth to improvement, modification, and rapidity in execution (size for size), from, in one direction or the other, the material used down to the method of riveting. But reduced to the common 1000-cubic-feet basis, it is perhaps in the greater dimensions of present-day holders (where the prosperity of the business will permit of freedom in the erection) that the maximum of economy is found; and therefore it is from holders of above the average size of the past that the greatest useful instruction will be derived, as year by year the growth of the industry will demand the provision of more and more holders of dimensions beyond the old order. In towns where holders of under a million cubic feet capacity at one time satisfied the ideas of the engineer, new erections are being put up to-day of a capacity of three, four, and even five fold. The Hull example has a capacity of upwards of 3½ million cubic feet; and the one which we are now about to describe will possess accommodation for 5½ millions, or equal to the output of the smaller of the present stations of the Newcastle and Gateshead Gas Company!

When the first peg for this new holder was driven, it marked the commencement of a complete scheme of gas-works of the first order which Mr. W. Doig Gibb has been called upon to design for his Company, and which (as was stated in a few general particulars published in the "JOURNAL" for April 30 last) will have an ultimate capacity of 15 million cubic feet per twenty-four hours. When the members of the North of England Gas Managers' Association visited the holder three days previous to the date mentioned, the tank was completed; and the holder was sufficiently far advanced for them to judge of the character of the work. We have not, from the examination then made, the least hesitation in saying that, in process of time, when the first section of the new works is completed, it will be found that the care and skill which Mr. Gibb has put into this part of the work permeate the whole of his plans.

Perhaps we ought to preface the description of the holder and tank by saying that the design is substantial, since, beyond boring, Mr. Gibb had had no experience of the ground. The situation is an exposed one; and old colliery workings exist below.

In the present article, we will deal with the tank only, the contract for which was let to, and has been successfully executed by, Mr. Walter Scott, whose work included the excavation. The tank is 239 feet in diameter inside, and 45 ft. 6 in. deep from the top of the stone curb to the bottom level of the concrete between the rest-stones. With this preliminary statement of the measurement, before proceeding to the constructive details, it will be useful to the reader to have some knowledge of the materials employed in the tank. The cement was of such a degree of fineness that not more than 10 per cent. by weight of it would remain as a residue on a wire screen of 5800 meshes to the inch, and had to weigh not less than 112 lbs. per imperial bushel. It was tested from time to time during the progress of the work for cohesive strength and setting properties—the specification demanding a cohesive strength in the pure cement of 350 lbs. per square inch after seven days' immersion in water. The cement was emptied from the bags on to a covered floor, and exposed for at least 24 hours before being used.

The whole of the mortar was composed of one part of portland cement to three parts of clean, sharp, river sand, free from dirt or salt, and finely screened.

The composition of the concrete was one part of portland cement and six parts of gravel, measured dry and net. The gravel consisted of three parts of coarse, screened stones, broken to such a size as would pass through a 1½-inch ring, and three parts of clean, sharp river or pit sand. The materials had to be first mixed dry on a platform, and turned over twice; then watered with just sufficient water to moisten them, and turned over three times—being subsequently thrown from a height of not more than 5 feet, well beaten down, packed by shovel to the sides of the excavation, and rammed and grouted into a compact mass with liquid cement and sand grout at every course. The directions were that the concrete should be deposited in layers of 1 foot; and that the total depth laid in one day should not exceed 3 feet—each layer of 1 foot being properly grouted and levelled. The faces of all the excavations were smoothly dressed off, and completely freed from all loose material; and the concrete placed so that, while it measured its full dimensions, it also completely abutted on the solid dressed-off faces of the excavations. The whole of the inside face of the tank wall, the bottom of the tank, and the entire surface of the cone were finished and trowelled off smoothly with special cement mortar ¾ inch thick, consisting of one part of portland cement to two parts of sand.

It may be conveniently stated here that the circular wall is tied with fifteen rings of bar iron, 6 in. by ⅜ in., in lengths of not less than 15 feet, and not more than 30 feet, riveted together with lap joints, and built into the wall.

All the bricks used in the tank for minor parts of the work were hard-burnt, picked bricks of an approved quality, even colour, and regular shape; and wherever necessary for curves, bevels, beads, &c., specially moulded bricks were secured. No bricks containing lime were allowed; and all bricks had to be repeatedly and thoroughly wetted before being laid. The brickwork was laid in English bond—rows of headers and stretchers alternately, and none but whole bricks were employed. Joints of not more than ¼ inch thick were permitted; and every second joint was well grouted with liquid cement grout—the interior of the walls being run up solid, and not merely lipped with cement round the outside. The external face of all brickwork was neatly pointed with ruled joints. The stone used throughout the work was the best quality ashlar, worked and fair-tooled on the beds, joints, and faces; and all the joints were close and clean made with the smallest amount of cement possible.

Sufficient has been said to show that due precautions were taken by Mr. Gibb to secure only the best material for making a sound, durable, water-tight job of the tank; and therefore we will now resume the description. The bottom of the tank is flat and horizontal for a distance of 8 ft. 6 in. from the wall all round; and the cone rises from this point to the centre. For a distance of 48 feet measured horizontally, the slope is 1 in 1½. It then changes, and is 1 in 48 to a point 6 feet from the centre, which 6 feet is level. The highest point of the finished cement mortar face of the cone is 12 feet below the level of the top of the curb.

The curbstone which runs round the top of the wall of the tank between the piers is 18 inches broad and 15 inches deep, in lengths of not less than 3 feet, properly tooled to shape, wrought to the circle, and well bedded in cement mortar. The inside face is finished with a sharp square edge, and the outside has the top corner bevelled off at an angle of 45°, 3 inches each way, measured on the square. The stones forming the curb are all keyed together with dove-tail keys, 3 inches wide tapering to 2½ inches, and 3 inches long, cut right through the stones, and run with liquid cement and sand grout, made in the proportion of one part of cement to two parts of sand.

The wall of the tank is formed of concrete, and is 7 feet thick at the bottom for a height of 7 feet. From this point, it is reduced with a regular batter, and is 3 ft. 6 in. thick at the top under the curb. The horizonal part of the tank bottom is 3 feet thick; and the slope of the cone is covered with concrete 9 inches thick. The centre of the cone is thickened out in the form of a circular block, 12 feet diameter and 3 feet thick. Under the floor of the cone, there are 26 radial ribs, starting at the bottom of the tank and running into the centre pillar. These ribs are 12 in. by 12 in. in section, and are exactly in line between the standards and the centre of the tank. There are four steps on the slope of the cone running right round the tank. These steps are worked out of the solid side of the cone, and are each 2 ft. 6 in. wide on the flat, and their upper faces are horizontal to receive the column feet for the tank framing.

There are 26 piers in the wall of the tank, equally divided out in the circumference. They are each 9 ft. 5 in. by 6 ft. 1 in. measured from the inside face of the tank wall; and they run this full section from top to bottom. The top of each is finished with four stones bedded in cement mortar; and the whole of the upper faces of these are dressed true and level and left perfectly smooth. The four stones forming the top of the pier are keyed together as in the case of the coping. Sixteen feet into each pier are built six holding-down bolts, 2½ inches diameter, which are furnished with anchor-frames at the lower end, composed of 9 in. by 1 in. plates. In the circumference of the tank, and built into and to the shape of the curbstone, are six cast-iron 8 in. by 6 in. overflow-pipes.

There are 52 steel tank guides fixed round the tank at equal distances apart—26 of 8 in. by 3¼ in. channel steel, and 26 of 6 in. by 3 in. channel steel. Each 8 in. by 3¼ in. channel guide is secured to the concrete of the wall by means of eight Lewis bolts, let 7 inches into the wall, and by two Lewis bolts at the top, let 5 inches into the stone coping and run with lead,

Each 6 in. by 3 in. channel guide is secured to the concrete of the wall by eight Lewis bolts, let 7 inches into the wall, and run with lead—the top being secured to a small casting on the top of the coping by means of two countersunk bolts; the castings themselves being held down with four Lewis bolts, let 5 inches into the stone, and run with lead.

In the bottom of the tank, there are 52 rest-stones, each 6 ft. 6 in. by 2 ft. by 1 ft. deep, and projecting 6 inches above the bottom of the tank, when bedded. They are fixed exactly opposite, and in radial line with the centres of the guide-rails.

The wall of the tank is thickened out to form a pier round the inlet and outlet pipes, which are built in solid. These pipes are 3 ft. 6 in. in diameter inside, formed of $\frac{1}{2}$-inch steel plate, butt-jointed, with 5 inch by $\frac{1}{2}$ inch cover strips riveted with $\frac{3}{4}$-inch rivets, $2\frac{1}{2}$-inch pitch. The flanges are formed of angle steel welded rings 4 in. by $3\frac{1}{2}$ in. by $\frac{3}{4}$ in. In all the pipes, there is only one longitudinal joint. There are two T pipes, all of steel plates and angles, with proper cover strips to both vertical, circular, and mitre joints, and $\frac{7}{8}$-inch cover-plates on the top, secured by $\frac{3}{4}$-inch bolts, and having 12-inch diameter holes cut through for the syphon-pipes. There are two syphon-boxes formed of steel plates and angles, 5 ft. by 5 ft. by 5 ft. 10 in. inside. There are two duck-foot bends, 7 feet radius on the centre, with turned angled flanges and base plates, 8 ft. by 2 ft. by $\frac{1}{2}$ inch. The inlet and outlet pipes will each be fitted with a syphon pump and suction pipe, the latter of which will be enclosed in a cast-iron seal pipe, 9 inches in diameter, which will allow of the pumping arrangement being withdrawn and overhauled without interfering with the ordinary working of the holder.

There is a hollow shaft or pier of brickwork on the centre of the cone, the internal diameter of which is 3 ft. 5 in. from the top to the bottom. The external diameter at the bottom is 6 ft. 8 in., with two footsteps in addition on to the concrete; and at a height of 21 feet, there is a square step in, and the diameter is reduced to 5 ft. 10 in. for a further distance of 9 ft. $11\frac{1}{2}$ in., when another square step reduces the diameter to 4 ft. 11 in. The total height is 31 ft. 9 in. After the iron framing is fixed in the tank, the shaft of this pillar will be run solid with cement concrete, and the top smoothed off level 2 inches below the top of a 6-inch cast-iron air-pipe.

A superficial examination of the tank impresses one that the work has been well done; the surfaces being smooth and free from irregularities. The cost of the tank—including work done by the Gas Company—will be about £25,000; but the iron and steel fittings mentioned here are included in the contract for the holder. The tank when filled will contain about $7\frac{1}{2}$ million gallons of water.

[With the present issue of the "JOURNAL," we reproduce, as a plate, one of the working drawings referring to the tank.]

*(To be continued.)*

## WESTERN (U.S.A.) GAS ASSOCIATION.

*(Continued from Vol.* LXXVII., *p.* 1751.)

The subject of "Gas and Hygiene" was treated in a paper by Mr. James Ferrier, of Columbus (Ga.), who directed attention to the growing importance of all matters pertaining to hygiene, and endeavoured to provide an answer to the questions: "What constitutes hygienic light? What constitutes hygienic heat? And what should be the policy of the gas company in view of the coming demand for both?" Light required to be diffused as much as possible, with avoidance of severe contrasts and inequalities. As to colour, the predominance of yellow rays was preferable; and the source of light should be well above the line of vision. For a given cost, more energy could be supplied by means of gas than by electricity. Energy sufficient to operate a 2000-candle arc lamp could be supplied by a burner delivering $2\frac{1}{2}$ cubic feet of gas per hour; and the prospects of future improvements were better for gas than for electricity. The author proceeded to illustrate how the heat and vitiated air from the combustion of gas—usually credited as hygienic disadvantages—could be turned to account for the promotion of ventilation, with the aid of a large diagram showing a section of the English Houses of Parliament. With a properly arranged Welsbach gas-burner, the products from which were carried off by a 3-inch flue, the heat radiated to surrounding objects was much less than that from an electric glow lamp. Attention was next directed to the question of what constitutes unwholesome air, and to the different ideas among authorities as to the proportion of carbonic acid that might safely be present; also as to whether it was only a diluent, or an active poison. Carbonic oxide was undoubtedly a poison; and the greater part of the organic matter present in the air of dwellings was of an objectionable character. From this, it followed that no method of lighting or heating could be characterized as hygienic that did not provide for the removal of foul air and the introduction of fresh air. The old-fashioned open grate, with all its faults, was a hygienic source of heat; hence its popularity. Convected heat as a rule was not hygienic; as radiated heat, and not hot air, was the thing required. The hot surface of a stove might destroy organic matter; but it did not follow that such destruction necessarily meant its conversion into a less objectionable form. A hygienic heater should afford chiefly radiant heat, discharge all products of combustion outside the apartment, and promote an incoming current—not a draught—of fresh air. Gas, properly applied, was a potent agent towards the maintenance of hygienic conditions. In concluding, he advocated full advertising of these capabilities, and the fitting up of new buildings, possibly with some bold departure from established lines, at the expense of the gas company, to illustrate what could be done.

Discussion being invited, Mr. Butterworth agreed that gas engineers should devote more attention to the hygienic aspect of gas lighting and cooking. In warm climates, the heat given out by the burner was a decided disadvantage if not removed from the apartment, or rather allowed to remove itself, in the manner indicated. There was great need for a cheap, simple, and reliable means of ventilating the living rooms in ordinary dwelling houses. One way of assisting this was by means of an opening in to the chimney, close to the ceiling, with a flap-door or valve that could be regulated by means of a cord, and which had been tried successfully in Europe. Mr. T. D. Miller said that the Welsbach mantle would eventually prove the means of greatly improving the quality of artificial light. Already it was a very near approach to sunlight; and this could be proved by spectrum analysis. Concentration of light upon desks or tables was a mistake. The most wholesome light was one that equally illuminated every part of the room. The disfigurement of decorated ceilings was a great drawback to the use of gas; and it would be done away with by the use of ventilated lights. He proceeded to argue that carbonic acid was simply a diluent, not an active poison. Many persons worked in atmospheres heavily charged with it; but no effect, other than that due to loss of oxygen, had ever been recorded. He had a high authority for the statement. So it was premature to say that an excess of carbonic acid in the air did produce poisonous results. Thermostatic regulation of gas-stoves would make gas the most popular heating agent extant. Mr. John D. M'Ilhenny admitted that very little had been done in the way of applying gas as a ventilating agent; and he described the method in use at the Audience Room in the Franklin Institute, Philadelphia. There are a number of upcast shafts, each having a gas-jet inside it; and the air in the room can, with them, be completely changed in 7 minutes. The disfigurement of the ceiling that had been referred to might be caused by an upward current of air, and was not necessarily due to the products of combustion. With regard to carbonic acid, some short time ago he had occasion to look up this particular subject, and found that several authorities agreed that it exercised some injurious effect. He had recently seen a hygienic gas-stove. Fresh air came in from outside and issued warm into the apartment; while the burners were fed with air from the room, and there was a flue that removed all the products of combustion. He suggested that the capabilities of gas as a ventilating agent should be brought to the notice of architects and builders. Mr. D. M'Donald had worked at the ideal gas heater problem, and found that the products of combustion must not be reduced below 212° before escaping from the flue, or there would be trouble from condensation of water. Therefore, they should not leave the stove at less than 350°. If this was done, and no more air was mixed with them, they would only carry away 5 per cent. of the heat; but if air was allowed to mix freely with them, practically the whole of the heat would go up the chimney. Not more than 25 per cent. of the heat could be obtained in the radiant form; and he ventured to say that 75 per cent. of the heat of any gas-fire was carried away with the products of combustion. An excess of moisture in the air was the biggest nuisance, and caused more complaint than carbonic acid or a little shortage of oxygen. Fresh air passed rapidly through ordinary brick and plaster; and if provision was made for the removal of the products of combustion, fresh air would find its way into ordinary rooms as fast as it was required.

Mr. Ferrier, in replying, referred to Dr. Haldane's experiments as distinctly proving that carbonic acid was something more than a mere diluent. It may be possible to endure an atmosphere charged with carbonic acid for a short time without suffering any bad effect; but the statistics in British mines showed that the greater the supply of air the greater the amount of work done, and that 6000 cubic feet of air per hour per man was not too much. Put a man in a carbonic acid charged atmosphere for six months and then see what kind of man you have, and what quality and quantity of work he could do. Dr. Angus Smith was the authority for the statement that it was premature to say that the smallest excess of carbonic acid may not produce toxic results. He went on to show that incomplete combustion was quite capable of producing inflammable and poisonous gases, such as cyanogen, acetylene, or carbonic oxide. It was a mistake to try to belittle the statements of scientists, even though they may sometimes exceed actual fact. He preferred, if there were pegs on which objections could be hung, to try and take those pegs out.

Mr. F. H. Shelton, of Philadelphia (Pa.), read a paper on a "Gas Association Library," in which he claimed that a circulating library of technical works would not only be useful in an educational, but in a general way. Gas managers often spent months experimenting upon a particular subject, when reference to some article or paper dealing with it would give the required information in a few minutes. There was not only the difficulty due to the want of particular books or periodicals, but also that of expeditiously finding what was wanted; and the library would not meet the requirements without a good subject-index, revised and brought up to date at frequent intervals, a copy of each edition being promptly issued to the members. The library

should comprise copies of each gas book published, files of the various gas journals and sets of Association proceedings, and the bulk of these could be obtained without cost. It should be limited to gas and kindred subjects. He produced a list of gas books that he had compiled, including some 200, exclusive of magazines and Association proceedings. He noted that England was the great source of gas-works literature—twenty books being published there to one in America. In concluding, he alluded to the library bequeathed to the Association by the late Mr. G. T. Thompson, which afforded the "Western" an opportunity to lead the way in a new field of educational work, and he hoped would prove the nucleus and starting point of a good Association library. In an appendix the author announced his intention of periodically revising and checking his list, and said that any information likely to be of use might be addressed to him at No. 112, North Broad Street, Philadelphia, and would be gratefully received.

Discussion being invited, Mr. M'Donald thought that the author had covered the ground so fully that there was nothing to do beyond gratefully recognizing the considerable amount of labour involved. Mr. Jenkins warmly supported the views expressed, and spoke eloquently in favour of the Association taking up the question at once, and providing a fund for the maintenance of a library. Mr. Miller referred to the work of indexing, and suggested that the members should each volunteer to take one or more books.

The Editor of the Wrinkle Department, Mr. F. H. Shelton, of Philadelphia, presented a report comprising 18 wrinkles, of which twelve had been prepared by himself, and were the result of his observations during his recent visit to Europe. Among other interesting items, it was stated that a large gasholder with steel tank was to be constructed at Amsterdam, and that within the tank a large store room would be constructed. A hemispherical dome or artificial dumpling was to be erected in place of the usual flat bottom; and the designer claimed that the additional cost was less than that of a store of similar capacity, while the ground room would be saved. The entrance was through an arch in the foundation wall, below ground, reached by an inclined passage to facilitate wheeling goods in and out. The author was told by Mr. F. D. Marshall, of Copenhagen, that several tanks on this plan were in successful operation in Denmark. At some places in Germany, the oxide floor was on the same level as the purifiers, usually in an annex to the main building; and a system of light overhead rails and iron tip-buckets was used to facilitate the transit of purifying material. At the works of the Imperial Continental Gas Association at Berlin, all inlet valves are painted black, outlets white, and bye-passes red. This greatly facilitates proper manipulation, and lessens risk of mistakes. Attention was also directed to the fact that in some makes of water-meters the figures show in line instead of by pointers on dials, and that the plan might advantageously be adopted for gas-meters.

The reading of the report was followed by a discussion. Mr. Odiorne mentioned that an ordinary cylindrical jar of potters' clay was an excellent temporary plug for a main pipe, as it could be easily broken and removed when required. If cemented in place, it would remain perfectly gas-tight. Mr. Miller said that he had all plugs made with a slight taper, and that plugs of that pattern could be easily loosened by a few blows from a hammer. Mr. Steinwedell thought the suggestion to colour valves different tints might be extended to all pipes, and that it would be a good plan to adopt a distinctive colour for each kind—gas, hot water, cold water, steam, tar, &c.

(*To be continued.*)

## MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

### Visit of the Members to Staveley.

The Members of the Association paid a visit last Saturday to the works of the Staveley Coal and Iron Company, Limited, at Staveley, near Chesterfield, which had been kindly thrown open by the Company for their inspection. The party travelled from Manchester by a special saloon train, and were received at Staveley by Mr. T. Gandy, the Assistant General Manager of the works, Mr. Knighton, the Manager of the new works, and Mr. Chambers, the Manager of the old works at Staveley, by whom they were conducted through the various departments.

The works at Staveley cover an area of 70 acres, and in addition to these the Company have smaller works at Broadoaks, occupying about 30 acres, while they also own a number of collieries. They employ in all some 9000 men, and own 1500 houses, which are used chiefly as the employees' residences. The production of iron at the works is about 130,000 tons per annum; the bulk being used in the manufacture of pipes and castings, of which the Company turn out 75,000 tons yearly. The pipes produced at Staveley range in diameter from 1½ to 72 inches, and those made at Broadoaks from 24 to 48 inches. About 50 per cent. of the entire production are supplied to gas companies and committees for mains and other requirements; while the remaining 50 per cent. are water-mains, electric-cable conduits, &c. At the collieries about 2,000,000 tons of coal are raised per annum; 25 per cent. of the output being supplied for gas-making purposes—the Company having exceptional arrangements for screening gas coal.

In going through the works, the party first visited No. 1 shop, which is devoted to the casting of pipes from 36 to 60 inches in diameter in 12-feet lengths; the capacity being 70 pipes a day. Here an opportunity was afforded for witnessing the casting of two 43-inch pipes, which were part of an order for the new water scheme of the Birmingham Corporation, in connection with which the Company have had contracts for £500,000 worth of pipes. Considerable interest was manifested in working the cranes, of which there were three—one a 30-ton electric crane, and the others 15-ton hydraulic cranes. A visit was next made to the No. 12 shop, where 4 and 6 inch pipes to the extent of a mile a day are made, in 12-feet lengths. The cranes for carrying the cores in this section are worked by compressed air. The cores are dried by gas from a water-bottom producer, which burns the lowest grade of fuel. There are two cupolas, capable of melting at the rate of 12 tons per hour. In this shop there was a very handy arrangement, worked by compressed air, for making the cores of pipes, which enabled one boy to turn out 600 a day, representing the work of four boys under the old system. The No. 10 shop, devoted to the production of 3-inch pipes, was also inspected. In crossing over to the cable conduit shop, Mr. Gandy drew attention to their gas-works, where 8000 cubic feet of gas per ton are obtained from common coal; there being two benches of five retorts. The gas is used for lighting the works, the employees' houses, &c. The pipes produced in the conduit shop are mainly used for carrying electric cables; the Company turning out about 1000 a week for this purpose. The No. 9 shop, which was next gone through, is devoted to the casting of 6-inch pipes in 9-feet lengths (or in 12-feet lengths, if required); the capacity being 144 of the former kind daily. In the No. 11 shop, 4 to 12 inch pipes are cast at the rate of 60 tons a day. In the special shop, where irregular castings, such as branches, bends, tees, connections, &c., are turned out, the capacity is 65 tons a day; while there is also a special shop, in the old portion of the works (which was not visited), having a capacity of about 55 tons a day.

Visits were next paid to the pattern shop, where about 60 men are employed, the pattern stores, the boiler-making and repairing yard, and to a new box-fitting shop, for the repair of pipe tackle, &c. It may here be mentioned that the Company have in all 240 boilers of the Lancashire type, principally 8 feet in diameter and 30 feet long, double-flued, as well as 10 locomotives. Some time was spent in the fitting, cutting off, turning, and boring departments, where attention was drawn to some pipes which were being made for the second line from Thirlmere to Manchester; the Staveley Company having secured the contract for the second of the four sections into which the contracts have been divided. The pipes passing through were 44 inches in diameter. Attention was next turned to the electric, compressed air, and hydraulic plant. In the former department, there are two generators, giving 700-horse power with a voltage of 220. The compressed-air plant supplies 100 lbs. pressure per square inch, and the hydraulic pumps 700 lbs. The Company, it may be added, have found that, for certain purposes, electric power is more effective than either hydraulic power or compressed air. The party next inspected the blowing-engines and the blast-furnaces; and it was mentioned by Mr. Gandy that the quantity of coal and coke used was 300,000 tons per annum. A set of boilers, fired by gas from the furnaces, were also examined with interest. In the testing departments, the visitors had an opportunity of seeing pipes tested to 300 lbs. by water, and to 200 lbs. with chemical oil. The heating and dipping plant was also inspected. The tour of the works was concluded by a visit to the waggon-building and repairing establishment. It was stated that the Company can make in this department, if necessary, twelve waggons a week, and that they have 4000 waggons engaged in their own coal traffic.

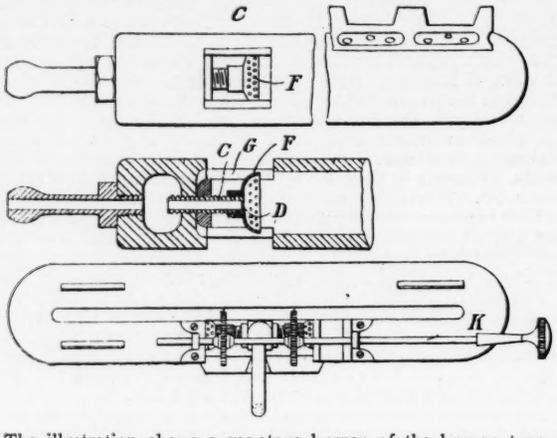
At the close of the visit, the party were entertained to luncheon by the Company. The President (Mr. C. Berry) proposed a vote of thanks to them for their kindness in allowing the members to visit the works, and the hospitality with which they had been received. They were exceedingly grateful to Mr. Gandy, to Mr. Knighton, and to Mr. Chambers, for the very courteous way in which they had conducted the party round the works. Of all the visits paid by the Association, this had been the most instructive, interesting, and enjoyable; and there was no doubt that the Staveley establishment was one of the best equipped works for its requirements in the kingdom. Mr. Garlick, in seconding the motion, spoke from personal experience as to the special suitability of the Company's pipes for the purposes of gas supply. Mr. Gandy, in responding, said he thought the Company could turn out work which could not be beaten either in Great Britain or in America. He expressed his pleasure at seeing the members of the Association, who he hoped had enjoyed the visit. Mr. Chambers also briefly responded.

**Flow of Water in Curved Pipes.**—According to a paper by the Chief Engineer to the Board of Water Commissioners of the City of Detroit (Mich.) which appears in last month's number of the "Proceedings of the American Society of Civil Engineers," the result of a series of experiments extending over six years leads to the conclusion that the resistance to the flow of water due to curvature is much less in short than in long radius curves for the same total length of pipe and angle of deflection. From numerous experiments upon a 30-inch and a 12-inch pipe, it appears that the 90° curve involving the least resistance in a total length of 80 diameters is one between 2 and 2½ diameters radius.

# REGISTER OF PATENTS.

**Stove Burners for Use with Water Gas.**—Richmond, J. R. & E. W. T., and Richmond and Co., Limited. No. 9914; May 29, 1900.

The patentees point out that considerable trouble has been experienced in regulating the proportional flow of gas and air in bunsen burners, especially when water gas is used, as the gas is sluggish, and it is often necessary to open up the holes of the jet to allow the gas to pass more freely. They propose therefore to provide means whereby the air supply to the burner can be easily adjusted—thus obviating the necessity of widening the holes in the jet. A further object is to provide means to prevent firing-back.




The illustration shows a gas-stove burner of the bunsen type, a section of the gas-inlet, and a view of the under-side of another form of burner of the same type.

Into the end of the body of the burner is screwed the usual nozzle attached to the main gas supply. The gas-tube C is screwed into a web cast in the burner, and consists of an externally-screwed piece of metal tube open at the one end, but closed at the other by a plate D, which has a number of small perforations in it through which the gas passes. Surrounding this jet is a perforated shield or flange F, which serves the double purpose of regulating the air supply and preventing firing-back. The air is admitted to mix with the gas in the burner through the openings G in either side of the main body. The shield may be adjusted to prevent any admission of air from the openings to the body, thus permitting only the small amount of air which passes through the perforations in the shield to mix with the gas entering through the tube C.

In operating, the tube C is screwed out of, or into the web, according to the amount of air required to mix with the gas being consumed; and it may be large enough to effect the required regulation alone—*i.e.*, without the perforated shield.

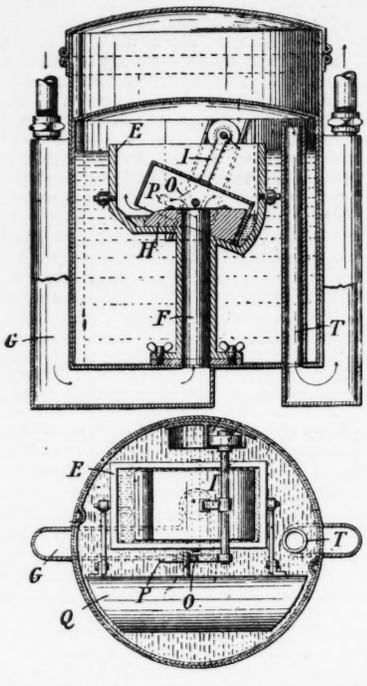
In the alternative arrangement, the jet is double-ended; both ends being provided with shields. In this case, the air supply is regulated simultaneously at both jets by means of a spindle K and gear-wheels attached thereto, which gear with pinions formed on the outside of extensions of the shields F and screwed internally, one with a right, and the other with a left-handed screw, so that when the spindle is turned, the shields approach, or recede from, each other.

**Gas Governor and Regulator.**—Thomas, A. T., of Manchester. No. 13,674; July 31, 1900.

The essential features of this gas-governor are a trough having a gas-inlet through its bottom, a tilting-box in the trough, a liquid-seal for the box when in a horizontal position, a vertically moving holder contained in a casing and surrounding the holder, a groove or race fixed to the holder, and a connection between the groove or race whereby the upward movement of the holder brings the box into, or towards, its horizontal position, and its downward movement causes the box to tilt.

The outer casing of the governor is closed by the cap, and contains a concentric gasholder, which is, as usual, closed at its upper end and open below. The water in the casing has its normal upper level just below the upper edge of the trough E, into which the gas can enter through the vertical pipe F, connected with the supply-pipe G. The trough is deeper on one side than the other, to permit the descending edge of the box shown to descend when it is tilted; and the central part of the trough is fitted with the block H, between which and the sides of the trough a channel is left, into which mercury is poured to such a height that it will cover the lower edge of the box when the latter is horizontal. The upper side of the box has an arm I secured to it; and this arm in turn is fixed to a horizontal spindle, one end of which carries a friction-bowl running in an inclined groove forming part of a fixing attached to the holder. The other end of the spindle has secured on it a dependent arm, on the lower part of which there is an inclined plane O and a stop P. The float Q is connected with the trough by two arms, and carries a projection capable of operating the arm. The gas escapes from the holder through the U-shaped pipe or outlet T.

The holder is shown in its lowest position; and the gas is entering the holder as indicated by the arrows. Assuming that the gas enters faster than it escapes, the holder will gradually rise, carrying with it the inclined groove. The result is that the friction-bowl is thereby moved over to the left, and the box is brought into the horizontal position and cuts off the further entry of gas. The holder is weighted so that, in its raised position, it produces a determined pressure in the outlet. As the gas escapes, the holder descends; and its inclined groove moves the friction-bowl, and consequently the tilting-box, in the reverse direction, and gas again enters the holder. In practice, the motions of the holder and the tilting-box are comparatively slight, even when the apparatus is in full work.

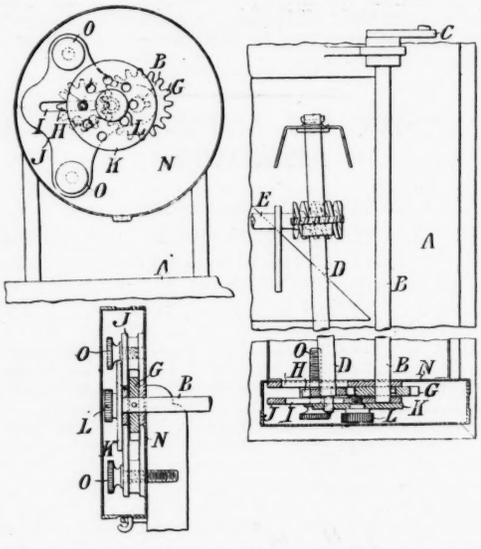



If the liquid should be at too low a level, the float Q will have descended until its projection has come into contact with the inclined part of the arm. In travelling down this inclined part, the arm is displaced to the right; and the tilting-box is consequently closed, and prevents any accidental escape of gas from the holder. The box is then held in the closed position by the weight of the float resting upon the stop P. The cap and the holder can thus be removed, and any necessary repairs made.

**Prepayment Gas-Meters.**—Metropolitan Gas-Meters, Limited, and Forster, J. D., of Peckham. No. 19,534; Oct. 31, 1900.

This invention relating to prepayment gas-meters, especially refers to means for readily adapting such meters to any variations in the price of gas; the improvements being chiefly applicable for use with meters of the kind described in patent No. 28,155 of 1896.

A is the attic of the meter, B the shaft which operates (through the medium of the crank C) the mechanism for controlling the supply of gas as described in the 1896 patent, D the shaft driven by the "two-foot" shaft E, and G H the gear-wheels whereby the shaft B is driven by the shaft D. All these parts are of well-known construction.




The gear-wheel G is made removable from the shaft B, so as to form a "change" wheel, and to enable the shaft D to be moved towards, or away from, the shaft B. To admit of this change being effected, one end is supported with a certain amount of play in bearing; while the other end, which carries the gear-wheel H, passes through a slot I in the guide-plate J—the casing through which the shaft D passes also being provided with a slot. K is the disc or plate carried by the guide-plate J, and which serves as a bearing for one end of the shaft D; a series of holes at varying distances from the centre being made in the disc, in any one of which the end of the shaft D can be supported. The disc is clamped upon the guide-plate (say) by a milled-headed

screw L passing through a hole in its centre, and into one of a series of holes M in the guide-plate. The guide-plate is clamped to the back of the box N, enclosing the change-mechanism, also by milled-headed screws O passing through holes in the plate. P is a hole with which the guide-plate is provided as a bearing for the end of the shaft B.

By removing the screw L to release the disc K, and then removing the screws O so as to release the guide-plate J, the wheel G can be removed and another one of different size substituted to gear with the wheel H, according to the variation in the price of gas; the shaft D being, in consequence, moved farther from, or nearer to, the shaft B. The guide-plate J and disc K are then replaced; the end of the shaft D engaging with a different hole in the disc from that with which it previously engaged. The holes M in the plate J permit a wider range of wheels being employed than would be the case with only one hole.

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**Manufacture of Gas.**—Allison, C. A.; a communication from A. H. Bronson, of New York. No. 6726; March 30, 1901.

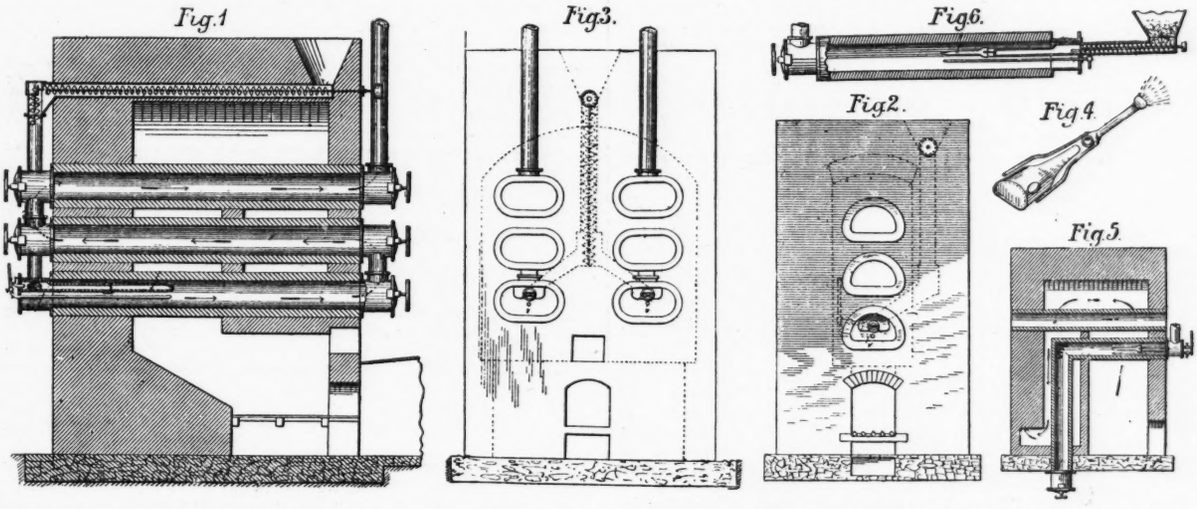
The patentee (in the course of a very long specification) describes his process of making gas, which "consists in gradually and continuously introducing a basic organic material from which the gas is to be generated, into a closed retort or regenerator which is highly heated, and at the same time practically excluding air."

Fig. 1 is a section of a bench of three retorts, embodying some of the novelties in apparatus to which the patent refers. Fig. 2 is a front elevation of the bench. Fig. 3 is a front elevation of a bench of sixes, showing the feed-pipe, dividing-chamber, &c., for continuous feeding of two generating retorts at the same time. Fig. 4 is an enlarged view of the feed-chamber used in the mouthpieces of the generating retorts, and of the extension feed-pipe for use inside the retorts. Fig. 5 is a view of a bench of three retorts, portions of two of which extend inward from the front of the bench in a horizontal plane, while the other portions are set at an angle thereto. Fig. 6 is a single generating retort, showing the devices as used when only small amounts of gas are required; and the feed-tank can be at, or near the front of, the retort or generator.

The patentee claims to have discovered that, by thoroughly wetting coal or other basic carbonaceous material used in gas making before it is charged into the retorts (instead of charging it as dry as possible, as is the prevailing practice), and by injecting highly superheated steam into and upon the wet material inside the closed heated generator or retort, and by the simultaneous interdistillation of the combined elements therein, and the exclusion of air therefrom, a very greatly increased volume of water gas is obtained, which is highly carburetted or enriched by the carbon and other constituents of the basic material used, as they are released in the course of distillation. He also says he has discovered that, when a retort is charged with a body of gas-producing material *en masse*, while considerable gas may be driven off under prevailing processes, a large proportion of the material (which, under proper conditions and treatment, might be converted into gas) is left—a carbonized non-gasifiable residuum; and that the distillation of the portion which is converted into gas is much slower when the heat can attack the material in mass only than is at all necessary.

Compared with the existing water-gas processes, the expenditure of the immense heat during and in the "blowing" up of the fire is obviated, and the great expense of doing this, and of enriching the gas, is saved. And as compared with producer or fuel gas processes, the present process practically excludes air (and consequently nitrogen); and its place is filled by pure oxygen and hydrogen, whereby a gas not only luminous, but having also some six times the calorific value of that made by the existing fuel-gas processes, is produced. It is said that, under proper treatment with chemicals and distillation by this process, an illuminating gas of far higher candle and calorific power can be produced from animal and vegetable waste and organic matter than is produced under ordinary processes from the best qualities of bituminous or gas coal, and that the proper intermixture of gases (from differently constituted organic matter), either in distillation or in the holder, produces a gas of higher candle power than the highest candle power of either of the gases prior to the mixture. In other words, the patentee makes use of such matter and material as is known to yield a high candle power gas as an enricher of the material yielding a lower grade of gas; but when more convenient or necessary, the different materials are distilled separately, and the resultant gases are intermixed in the holder.

In the bench of horizontal retorts shown, the first (or generating) retort is the lowest one; and there are above it two superheating




retorts. They are all so located in the setting that heat from the furnace, when running, will surround them and give them a high degree of heat. There are connecting pipes between three retorts, in sequence but at different ends; and a third pipe leads off to the hydraulic main. The pipes are preferably not less than 8-inch, "to accommodate the great volume of rapidly generated gas, to relieve the retorts from the pressure of which a more than usually strong exhauster must be used."

Upon the upper part of the bench is a hopper-shaped tank for holding the pulverized material, carried from the grinding or pulverizing floor by an elevator (neither shown), and for leading the same into a feed-pipe to be carried by feed-screws through the setting, over the furnace arch, in order that it may be thoroughly heated, thence down to the level of the upper part of the mouthpiece of the bottom retort into the small feed-chamber in it, and through it for a few feet into the extreme heat of the retort.

As stated, the feed-pipe extends into the retort; but (for the purpose of delaying the passage of the materials somewhat within the mouthpiece and front part of the retort, and thereby further increasing the temperature of it just prior to its being showered into the intense heat of the retort) there is placed within, and at the upper part of, the mouthpiece, a cast-iron feed-chamber, of such greater dimensions than the feed-pipe as will subject the material to a brief re-heating in its passage through it, before it is discharged into the retort. This feed-chamber is so constructed as to form a steam-chamber in the front and top thereof, and is drawn down to about the size and capacity of the feed-pipe at the point of discharge. Over the inner end of the feed-chamber is placed a steel pipe (of the same size as the feed-pipe), belled at one end to a size that will permit its being slipped over the tubular end of the feed-chamber, and flattened and widened to constitute at its mouth a wide aperture or slit of comparatively little height, in order that the material may find its exit in a thin, wide stream, which may be caught up by a like stream of superheated steam and carried forward and sprayed into the extreme heat of the retort. The steel pipe is used for whatever extension of the feed-chamber is required to carry the comminuted material to the point in the generating retort where it can be most productively discharged into the proper heat; but it is not used when the feed-chamber alone satisfactorily serves the purpose.

The steam-pipes lead from the boiler into, and through, such heating space within the setting as will thoroughly superheat the steam to the charging end of the generating retort, where a branch is made—one limb passing into the feed-chamber and the other through the head of the retort (preferably immediately below the feed-chamber and pipe) to a point about longitudinally even with the inner end or discharge of the steel feed-pipe, and just below it. "This steam-pipe is also flattened at its inner end to an extent that will present such a wide, but very thin, opening at that point as will effectually result in the formation and delivery of a sheet of superheated steam of sufficient force and strength to carry the stream of hot pulverized material into, and over, the highest heat in the retort, and shower it thereupon and thereinto." At the back end of the generating retort is a grating for the purpose of retaining any incandescent coke that may be pushed back against it.

In preparing to make gas, the patentee prefers to first pulverize the coal to a condition of great fineness, and then convey it from the grinding floor to the feeding tank or hopper, into which tank is also introduced "the chemical for the causing of more rapid and perfect decomposition of the mass of pulverized material, unless some or all of such chemicals in solution have been previously showered upon, or otherwise introduced into, the material upon the grinding floor." In either case, the pulverized material is made thoroughly wet by the application of such quantity of water as may be necessary, while upon the grinding floor or in the feeding-tank.

The materials used in making gas by the process are "all kinds of animal and vegetable growth and matter, sewage sludge, as well as all varieties of wood, coal, and lignite, and all kinds of waste material of organic origin." The whole must be pulverized unless of such fineness as to admit of its being carried through the feed-pipes into the generating retort without further comminution; and "excepting sometimes such soft, tender, or partially decomposed vegetable or animal matter as naturally contains a large percentage of water." These, the patentee says, he finds will make much more and better gas under a low heat and slow distillation, and which matter, after treatment with chemical, it is preferred to charge into the retort without special mechanical disintegration, at a point of low heat near the mouthpiece.

The chemicals used as dissolvents and decomposers or as a flux,

upon, or in admixture with, the organic matter to be gasified, are as follows: For the purpose of still further advancing the physical dissolution and decomposition of the organic matter, and of putting it into the best possible condition for quick and effectual chemical decomposition, chloride of lime (or its equivalents), and for the purpose of advancing and assisting in the quick and effectual chemical breaking up and decomposition of the constituents of the material used, caustic soda, caustic potash, or other most available equivalent matter of a caustic nature, are employed. Either, or both, of these may be sprayed upon the material, or fed into the feed-tank in admixture therewith as the material is deposited therein, or combined with the material in any convenient way. A quantity of unslaked lime may also be used; but excellent results are said to be attained by use of the caustic alone.

About ¾ to 1 lb. of caustic, and an equal amount of chloride of lime, are sufficient for 1000 lbs. of finely pulverized coal, or the same weight of other organic matter in its natural condition, to which is added liquid enough to wet the mass—to the coal, say, 20 to 30 per cent. of its own weight. But if the material be itself wet, or it is practicable to provide other means for a thorough commingling of the particles, the water may be omitted. The amount of caustic or chloride of lime to be used can be increased to any extent below that at which it will damage the gas produced (either by affecting its heat units or illuminating power or otherwise), which point can readily be determined, and will vary according to the refractoriness of the basic material. But the use of larger quantities than above specified, except in proportion to the increased refractoriness or bulk of any given material, is wasteful, in that it involves an increased expenditure without correspondingly increased useful results. Of unslaked lime, about 30 to 1000 lbs. of basic material may be combined with the pulverized material in the course of its reduction.

Fire having been started in the furnace, the temperature of the retorts having been raised to the proper heat, and sufficient of the pulverized basic materials and chemicals having been placed in the feed-tank or hopper, where they become somewhat heated, charges of coal in its natural state are inserted into the generating and superheating retorts, for the purpose of making the incandescent coke for use in the retorts, and immediately thereafter the feed mechanism is put in motion, so that the basic material will be driven by it from the feed-tank to and through the feed-chamber into the generating retort; and at the same time, when the material reaches the point of discharge from the feed-chamber, the steam is turned on, with the result that, when the material issues from the feed-chamber, the superheated steam carries it forward and showers it broadly upon and into the extreme heat of the retort. In its course through the feed-pipe, the material has already become highly heated, and to a considerable extent gasified; and "upon being thus projected into the generating retort and carried as upon a sheet of superheated steam in fine and thoroughly spread or diffused particles, all at an already high temperature, this basic material must, if injected in quantity within the limit of perfect decomposition, be instantaneously and continuously converted into gas." The gas then passes through the small body of incandescent coke which has been made, and shoved to the back end of the generating retort against the grating; and thence through the large body of incandescent coke which has been made and left in the superheating retort on its course to the final superheating retort. In that passage all possibly remaining watery vapour is fully decomposed, and such carbonic acid gas as may have been already generated is substantially all re-converted into combustible carbon monoxide, in quantity greatly in excess of its own original volume; and the whole volume of gas is thoroughly and permanently fixed, as it passes on to and through the final superheating retort into the hydraulic main. It thence goes through the usual exhauster (which must be of sufficient power to relieve the retorts of the pressure of the great volume of gas so rapidly generated) and the usual scrubbers, purifiers, &c., into the holder, a pure gas of high illuminating and calorific power.

The process is especially valuable from the fact that, without change, it can be used alternately for the purpose of making either fuel or illuminating gas of high grade and value—that is, by proceeding as stated and by using pulverized coal only (of any kind containing a good percentage of carbon) as a basic material; and by increasing the volume of superheated steam injected thereinto as a carrier, there is generated so great a quantity of good fuel gas as to favourably compare with the total volume of producer or fuel gas now made from a ton of coal by other processes, the 60 per cent. of nitrogen contained in producer gas as ordinarily created being by this process virtually excluded by the exclusion of air, and replaced by the oxygen and hydrogen of superheated steam, which of itself is high in heat units, instead of an inert and deleterious element in combination with other gases, as nitrogen.

By providing a separate holder for fuel gas alone, when such gas is required, and connecting it with the hydraulic main, a sufficient quantity can at any time be made for use as fuel in the furnace of the bench or for sale for other heating purposes, or (as it is in reality of fair illuminating power as well as high in heat units if made from good material) it can at any time be intermixed with the richer gas in the illuminating gasholder without detriment; while a return to the production of the latter requires but the turning of valves, a decrease in the volume of steam, and a possible use of more or less of such other organic matter as will yield a higher candle power when required.

If at any time, in consequence (say) of using very poor coal, it is desirable to further enrich the gas being made, this is done by introducing a small stream of petroleum or other hydrocarbon, under pressure, through a pipe inserted into, and passing nearly through, the steam-pipe that enters the feed-chamber; and through it, and with the force of the steam, the hydrocarbon is driven into the gas-making material in, and passing through, the feed-chamber, and into the retort. There is thus maintained such a connection and intermixture of comminuted and partially decomposed basic material, superheated steam, and hydrocarbon, that their constituents, already separated into minute particles, "are all together instantaneously submitted to intense heat in the retort, and consequent final decomposition and release, and permanent affinitive re-union into a useful and valuable gas."

In the use of the process, when more gas is required than can be well made in a bench containing only three retorts, a double bench may be used (as shown in fig. 3), with feed-pipes and conveyors sufficiently enlarged to supply the two generating retorts through the dividing chamber.

Where but comparatively small amounts of gas are required, or can be disposed of, the feed-pipe and conveyor are dispensed with, so far as passing same through the bench over the arch of the furnace, and the feed-tank and pipe are placed at the front of the bench and retorts. The generating retort is then fed therefrom and therethrough by a screw conveyor, or other pressure or carrying power, through the feed-chamber therein, as described (see fig. 6, which is a drawing of a single generating retort and feed apparatus), relying upon the latter and upon slow feeding for the heating of the material, and using the superheated steam, &c., in the manner before described. But where the best possible results are desired, and circumstances would permit the erection of plant especially adapted to accomplish these results, the same style of bench is used, the same treatment of material, and the same continuous feeding thereof into the generating retort; but in the construction of the bench two or more retorts are made in the form shown in fig. 5—that is, a horizontal portion and a continuation at a right angle with a second superheating retort (when one is desired) of the same style of construction as in the benches already described, directly above them and running horizontally through the bench.

The objects and results of using this form of retort are two-fold: One is to the end that the injected material may in the main be thrown over and into the extreme heat of the retort and against the bend; so that all the material that, in consequence of not having been already gasified, may fall through the intense heat in the leg of the retort (a distance of several feet) will be gasified in the falling, instead of dropping upon the bottom of a horizontal retort to be drawn therefrom and re-ground and re-distilled. The other advantage is consequent upon the driving of the not already gasified material forcibly against a rough and jagged surface at the bend in the retort, by which the material, in striking it, is again broken up and diversified so that the heat in the leg of the retort through which it falls may again attack it in more minute particles.

At their terminus in a pit (beneath the back part of the bench), the ends of these retorts are fitted with mouthpieces or covers through which ash and any other material accumulating may be withdrawn. Little or no incandescent coke is necessarily held in the bottom of the generating retort; but its companion, the first superheating retort, may be filled with it when desired—it being provided with a grating at its bottom to prevent the falling of the coke into the mouthpiece and into the pipe through which the gas passes from the generating retort thereinto, and thence up through the bed of incandescent coke and out at the front of the retort, through the pipe connecting it with the second superheating retort, and through it to the hydraulic main.

The process of gas making with this form of retort is in all respects the same as with the horizontal retorts already described; coal being inserted in the front of the first superheating retort, there distilled into coke, which is then broken up and shoved over into the leg of the retort, there to remain until withdrawn from the bottom.

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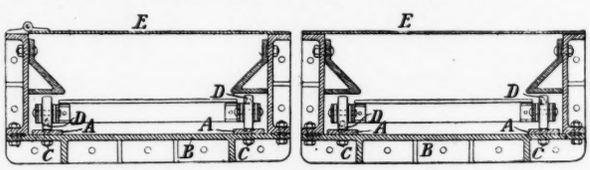
**Hot-Coke Conveyors.**—Graham, M., of Leeds. No. 8877; April 30, 1901.

This invention relates to hot-coke conveyor troughs of the type described in patents No. 24,659 of 1899 and No. 11,979 of 1900, so as to provide detachable and renewable roller-paths for the conveyor-chain within the trough, and also an improved form of trough.




The patentee employs strips A, which are attached to the bottom of the trough B, preferably by countersunk bolts C, so as to form raised paths for the rollers or runners D of the conveyor-chain; the strips A taking the wear due to the motion of the conveyor-chain within the trough, and being detachable for renewal when required. The improved form of trough has a lid or cover E, either hinged at one side of the trough or laid flat over the trough. In the latter case, the cover may, if desired, be secured in position by bolts, levers, or other suitable means, or it may fit in a suitable recess in the top of the trough.

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**Gasholders.**—Mayer, F. J., of Baltimore, U.S.A. No. 8887; April 30, 1901.

This invention relates: First, to a peculiar construction of gasholder tank whereby the necessary tensile strength to resist internal pressure is obtained by reinforcing a comparatively thin shell, rather than depending on the shell alone—"thus avoiding the handling and manipulation of heavy plates." Secondly, to the formation of the tank proper in independent segmental sections which are erected as entireties, and only require to be connected to form a circular body.

Fig. 1 (p. 31) is an elevation of the suggested gasholder tank. Fig. 2 is a plan. Fig. 3 is an enlarged exterior top view of one of the segmental sections of the tank. Fig. 4 is a section, and a modified construction of tank. Fig. 5 is an enlarged vertical section of fig. 4. Fig. 6 is an end view of fig. 3, looking in the direction of the arrow.

A is a circular plate situated at the centre of the foundation of the tank, and B an annular plate forming a part of the wall of same. The annular plate has a downwardly-extending flange C connected to the plate A by tie-bolts having turnbuckles. The plates are seated on the concrete foundation D, and over them is poured grouting, which forms the floor of the tank. The wall of the tank is made of segmental sections X, each one of which is constructed as an entirety. In the erection of the tank, the sections are placed together, and their adjoining ends united by rivets, after which the whole is strengthened by a system of wire-ropes wound around the structure.

At each end of a section X is a vertical channel-iron secured to a vertical plate by angle-irons and the necessary rivets. The channel-irons serve as guides for the rollers of the gasholder (not shown).

E are angle-irons bent so as to form a series of segments having a small radius (see particularly fig. 4). At the junction of the small segments are secured the I beams F, which extend from the top to the bottom of the tank. Instead of an I beam at the centre of the segmental section X, is a plate G similar to the ones before referred to; and this plate is provided with a channel-iron like the others.

*Fig.1.*

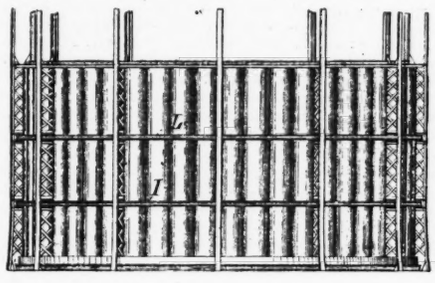
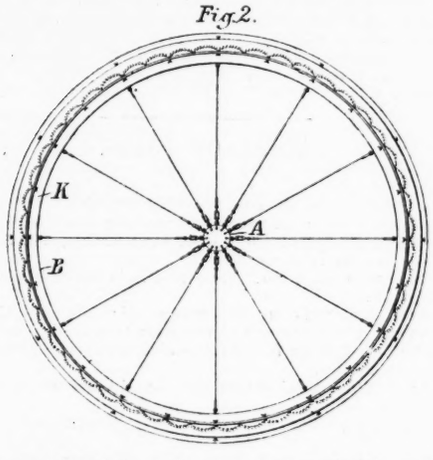



*Fig.2.*




The segmental angle-irons E support the steel plates or sheets H, which extend the entire height of the tank; and the lateral edges of these plates are flanged inward and riveted to the plates and the I beams F.

I are horizontally-placed segmental channel-irons situated exteriorly of, and at some distance from, the inner wall of the segmental sheets, and secured to the angle-irons E by lattice-work consisting of crossed flat-bars, secured to the horizontally-placed segmental channel-irons I by the angle-irons J.

The standards are situated where the segmental sections X adjoin; and they consist each of a flat plate flared out at the bottom and secured to the plates by means of lattice-work and angle-irons. The whole structure thus far described is covered by the head-plate K.

Around the annuli formed by the segmental channel-irons I, are tightly wound the steel cables which bind the whole tank circumferentially—"reinforcing it and adding to its inherent strength." The cables may be separate and independent of each other, or a single cable may be wound around each annulus and secured, "as their office is to increase the tensile strength of the remaining portion of the structure."

Within the lower channel-iron annulus I is placed a circular plate M, and between this plate and the segmental plates H is a body of grouting to render the tank water-tight at the bottom.

In the alternative construction of fig. 4, the segmental plates H are reversed in position, and present to the interior of the tank convex instead of concave surfaces. In this construction, the plates are subjected to a compressing instead of a tensile strain; and they are reinforced by interior and exterior coverings of concrete. In other respects the construction of the tank is the same as that already described.

*Fig.3*

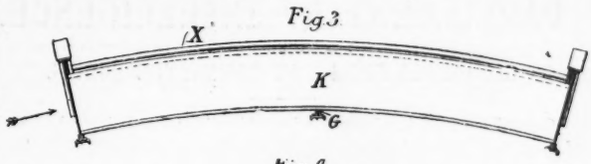



*Fig 4.*

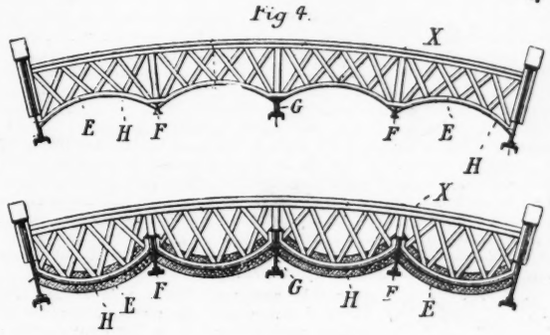



*Fig.5.*

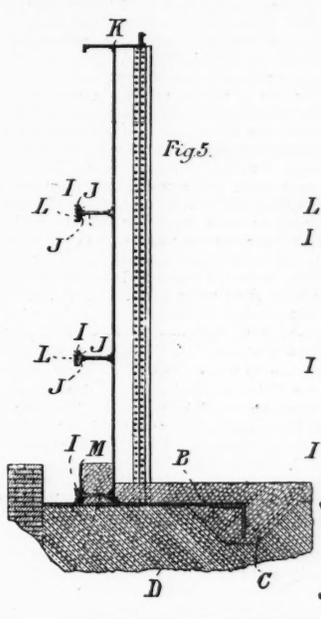
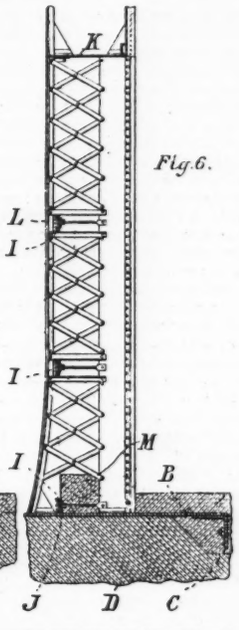



*Fig.6.*




## APPLICATIONS FOR LETTERS PATENT.

12,292-3.—Newbigging, W., and Franks, E. A., "Gas-purifiers." June 17.

12,307.—Imray, O., "Gas-producer." A communication from La Société Anonyme pour la Production et l'Emploi de la Vapeur Surchauffée. June 17.

12,311.—Naef, P., "Treatment of materials with gases." June 17.

12,337.—Tomley, E., "Gas-meter boxes." June 17.

12,348.—Cowan, W., "Prepayment gas-meters." June 17.

12,363.—Wright, J. W. B., and Darwin, H., "Gas-irons." June 18.

12,364.—Wright, J. W. B., and Darwin, H., "Burners for gas-stoves." June 18.

12,365.—Wright, J. W. B., and Darwin, H., "Gas-stoves." June 18.

12,367.—Bates, A., and Johnson, J. C., "Gas-engines." June 18.

12,411.—Burdon, C. B., "Gas-producers." A communication from A. Frey. June 18.

12,413.—Buhlmann, G., "Incandescent mantles." June 18.

12,432.—Hooker, W., "Gas-burners." June 18.

12,490.—Kerr, G., jun., "Acetylene-generator." June 19.

12,521.—Law, G. F., "Gas-burners." June 19.

12,532.—Smith-Rewse, H. S., and Coates, T., "Gas-purifiers." June 19.

12,579.—Thomas, J., and Podmore, A. E., "Incandescent gas-lamps." June 20.

12,651.—Browning, A. G., "Water meters and motors, gas-meters, and the like." June 21.

12,696.—Heinzerling, C., "Direct utilization of the heat of hot gases for the production of power." June 21.

12,702.—Woodward, J., "Conveying, screening, and loading coke, coal, and other materials." June 21.

12,710.—Cowan, J., "Gas-producers." June 21.

12,738.—Robinson, H., "Gas-engines." June 22.

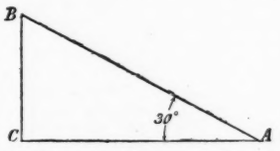
# CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

### Simmance-Abady Double-Standard Photometer.

Sir,—In your notice of the double standard photometer, for which Mr. Simmance and I are responsible, you give the formula as being—

$$AB^2 = AC^2 + (AC \tan A)^2.$$




*where AC is the distance from the disc to the light under test*, and A the angle observed by the sextant mirror of the disc-box.

Would you kindly state that this AC is the *horizontal* distance from the disc to a perpendicular dropped from the light under test; this being the distance which is easily measurable, and, in fact, the only one which is required. The formula is made clearer by the diagram. The multipliers simply give a short cut; and, instead of using the above formula, what you do is to multiply $AC^2$ by X, where X is the constant in the table.

*Westminster, June 26, 1901.* Jacques Abady.

# PARLIAMENTARY INTELLIGENCE.

## GLEANINGS FROM THE COMMITTEE ROOMS.

Committee work has been at a low ebb. The Lords have had little doing; and the Bills in the Commons are of an uninteresting character so far as the "JOURNAL" is concerned. One of the few Gas Bills entered in the lists to run the gauntlet a second time this session is the Aldershot Gas and Water Company's Bill; and it was disposed of last week. On this occasion the opponents succeeded in leaving a heavy impression upon it; yet their case was just as flimsy as when the Bill was before the Commons. Such are the fortunes of parliamentary warfare! The Mond and the South Metropolitan Gas Bills are the measures which will afford a little relief to the present dulness of the Committee rooms. They will be taken in hand at the end of this or the beginning of next week. Last week there was little in the water line to engage attention. This to Committee men and Counsel was no doubt a source of regret, as during such sultry days as we have been experiencing to hear and talk about water is, in the Committee rooms, refreshing and something to be thankful for. Electricity and tramway matters are the leading lines just now.

**The Aldershot Council's "Fluke."** It may be supposed that the Aldershot District Council fancy they have retrieved some of the dignity which they lost in the eyes of the ratepayers when they opposed the Gas Company's Bill before the House of Commons Committee. They have in the Lords succeeded in getting one of the most important parts of the Bill carved out, and other portions considerably modified—not by any increased merit in the case they put before the Committee on this occasion, but simply by sheer good luck. This must be so; for it would require a very powerful magnifying glass to detect any difference in the quality of the composition of the evidence laid before the Commons a short time since and the Lords last week. The ratepayers and local newspapers scoffed at the weakness of the case against the Bill, and derided the Council after the fiasco in the Commons; and now, to be consistent, they ought to smile at the noble Lords who swallowed the same case a few days since. One can imagine those councillors who have been irritated by the scourging they got a few weeks since walking the streets of Aldershot to-day puffed with vainglory. But the ratepayers, if they have had the arguments and evidence before the Lords presented to them in the local Press with the same fulness that they were given a short time since, will look smilingly on this little passing inflation.

One of the principal proposals of the Bill was the purchase, under an agreement, of the works of the Yorktown and Blackwater Gas Company; and this intention appears to have been merely fastened on as a subject for opposition, as the Bill presented nothing else but shallow ground in which a case for hostility could be planted The argument was that the purchase would be financially detrimental to the gas consumers of Aldershot; and this was worked up for all it was worth. But Mr. Corbet Woodall, Mr. A. F. Wilson (the Chairman), and the Directors of the Aldershot Company are of opinion that the transaction would have been of mutual advantage to the consumers in both the Aldershot and Yorktown districts, and to the Aldershot Company; and we can hardly admit that these gentlemen—expert and commercial—are so foolhardy that they would incautiously enter into a transaction of this kind. It is not an unnatural thing to suppose that they have a better knowledge of the gas requirements and possibilities of the districts than the Aldershot Councillors, and that they were hardly likely to do anything which would injure their present possessions. The only object of the Council—unexpressed, but pretty clear—was to prevent the Company, if possible, gaining strength by broadening their basis. It is therefore difficult to see on what ground their Lordships denied the Company the power to purchase; and it would be interesting to know what moved them to cut down the suggested capital from £120,000 to £50,000, with usual borrowing powers. The former figure was not an extravagant one for a Company of the size of Aldershot; and, in fact, even with that amount at command, Mr. Corbet Woodall expected they would have to return to Parliament within a few years. On both points their Lordships' decision appears capricious, and not guided by facts or reason. The clause imposed by the Commons as to pressure was slightly modified; the Council's request for a testing-station away from the works at the Company's expense was met by permission being given to the Council to provide one out of local funds; and the Council further obtained their desire for the separate keeping of the Company's gas and water accounts. This is decidedly a case in which the money of the ratepayers has been employed in the foolish task of cramping a local industry in the work of meeting the requirements of the inhabitants in the best possible manner. Yet the councillors will delude themselves that they have done a glorious thing.

**Electrolysis.** In last week's notes, we were able to insert, just as the "JOURNAL" was going to press, the bare announcement that the Metropolitan Water Companies had failed in their struggle to secure further protection from electrolysis in the London United Tramways Bill; and yet it may be said that right through the hearing, the Chairman of the Committee (Sir John Kennaway) exhibited a decided leaning towards the view of the petitioners. On Monday, Mr. William King furnished the Committee with some examples of erosion which have occurred on the Liverpool gas distribution system, within close proximity to the electrical tramways. An instance was also supplied from South London by Mr. C. C. Carpenter; the pipe in this case being near the generating station of the City and South London Electric Railway. Professors Perry and Dewar added to the scientific evidence already adduced. But Professor Ayrton's took the palm for freshness; and it was really of a startling character—so much so, in fact, that he was recalled to give confirmatory testimony at Monday's sitting. In face of the bulk of uncontroverted evidence placed before this Committee as to the danger which threatens gas and water distribution systems, it seems that nothing short of a grave disaster will move Parliament into granting in this direction adequate defence to existing rights, property, and the public. The Companies in this instance asked for compensation and insulated return clauses; but of the two they had a decided preference for the latter—in order that the water supply to the consumers should not be jeopardized. Mr. Balfour Browne appeared to be filled with pious indignation at the effrontery of the petitioners in asking for the insulated return clause, seeing that his opposing friend did not quote a single case in which such a clause had been put upon promoters. But in everything the start has to be made somewhere; and Mr. Balfour Browne is an old parliamentary hand, who could look back to a few precedents that he himself has initiated in the Committee Rooms. There would be "a merry little twinkle in his eye" as he glanced over the list.

**Burgess Hill Water.** All through a little quibbling, the Burgess Hill Water Company's Bill had to be reinstated as an opposed measure; and it came before Lord Harris's Committee yesterday week. The District Council were the opponents; but they were not hostile to the Bill on its merits. It seems there had been negotiations in regard to a reduction of charges in respect of the poorer class of property supplied with water, and also as to a request that the Company should not apply their maximum charges to houses over £13 in rateable value. It was very unlikely the Company would consent to being tied hand and foot below their rightful charges; and when the parties came before the Committee, it was plain that Counsel for the Local Authority felt he had no good cause for being there. Mr. Wedderburn made it clear that there was no intention on the part of the Company to alter their charges; but they would not give up the right to do so, if circumstances required. Counsel for the petitioners meekly told the Committee that all they asked for was an assurance that threats to raise the charges were never made, or, if made, would not be acted upon. After Mr. Wedderburn's statement, however, he withdrew the opposition. The Committee showed their feeling in the matter by deciding the question of costs in favour of the promoters. And then Mr. Wedderburn felt he could magnanimously withdraw allegations he had made of breach of faith on the part of the petitioners.

## HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Rhyl Improvement Bill, Winsford Urban District (Gas Transfer, &c.) Bill.

Bill read a second time: Winsford Urban District (Gas Transfer, &c.) Bill.

Bills read a second time and committed: Aldeburgh Corporation (Water) Bill, Blackburn Corporation Bill, British Gaslight Company Bill, Cromer Water Bill, Golborne Gas Bill, Wallasey Improvement Bill.

Bills reported: Dorking Gas Bill, Local Government Provisional Order (Gas) Bill.

Bills reported, with amendments: Dover Gas Bill, Kettering Urban District Water Bill, Llandrindod Wells Urban District Council Water Bill, Mansfield Corporation Bill, Petersfield and Selsey Gas Bill, Tees Valley Water Board Bill.

Bills read the third time and passed: Ardrossan Gas and Water Order Confirmation Bill, Derwent Valley Water Board Bill, Kettering Urban District Water Bill, Leeds Corporation Water Bill, Petersfield and Selsey Gas Bill, Richmond Gas Bill, Rugby Water and Improvement Bill, Salford Corporation Bill, Stockport Corporation Water Bill, Tendring Hundred Water Bill, Water Orders Confirmation Bills (Nos. 1 and 2), West Surrey Water Bill.

The Bexley Tramways Bill, the Bingley Urban District Council Bill, the Bradford Corporation Bill, and the Kingston-upon-Hull Corporation Bill have been referred to a Select Committee, consisting of Lord Clonbrock (Chairman), the Earl of Abingdon, the Marquis of Bristol, Lord Hylton, and Lord Monckton, whose sittings commenced yesterday.

The Metropolitan Water Companies (Amendment of Acts) Bill and the South Metropolitan Gas Bill have been referred to a Select Committee, consisting of Viscount Falkland (Chairman), the Earl of Londesborough, Lord Carysfort, Lord Napier, and Lord Hamilton of Dalzell; to meet next Thursday.

The Golborne Gas Bill and the Mond Gas Bill have been referred to a Select Committee, consisting of Lord Hatherton (Chairman), the Marquis of Winchester, Earl Craven, Lord Ardilaun, and Lord St. Oswald; to meet next Thursday.

The Select Committee on the Burgess Hill Water Bill reported that the preamble had been proved, but that they had not proceeded further with the consideration of the Bill, the opposition thereto having been withdrawn; and that they had awarded costs to the promoters. The Bill has been re-committed.

The Gaslight and Coke Company have petitioned against alteration in the South Metropolitan Gas Bill.

## HOUSE OF COMMONS.

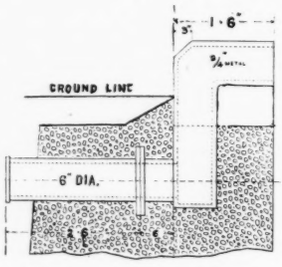
The following further progress has been made with Bills:—

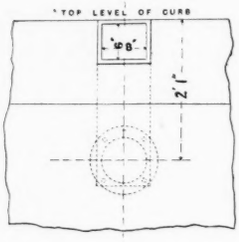
Bills brought from the Lords, read the first time, and referred to the Examiners: Harrogate Water Bill, Leeds Corporation Water Bill, Ripon Corporation Bill, Rugby Water and Improvement Bill, Salford Corporation Bill, Stockport Corporation Water Bill, Stratton and Bude Improvement Bill, Water Orders Confirmation Bills (Nos. 1 and 2).

Bill read a second time: Elland Gas Bill.

Lords Bills read a second time and committed: Barrow-in-Furness Corporation Bill, Gas and Water Orders Confirmation Bill, Gas Orders Confirmation Bill, Heywood and Middleton Water Board Bill, Wisbech Water Bill.

Bills reported, with amendments: Biggleswade Water Board Bill, Faversham Water Bill, Sheffield Corporation Bill.

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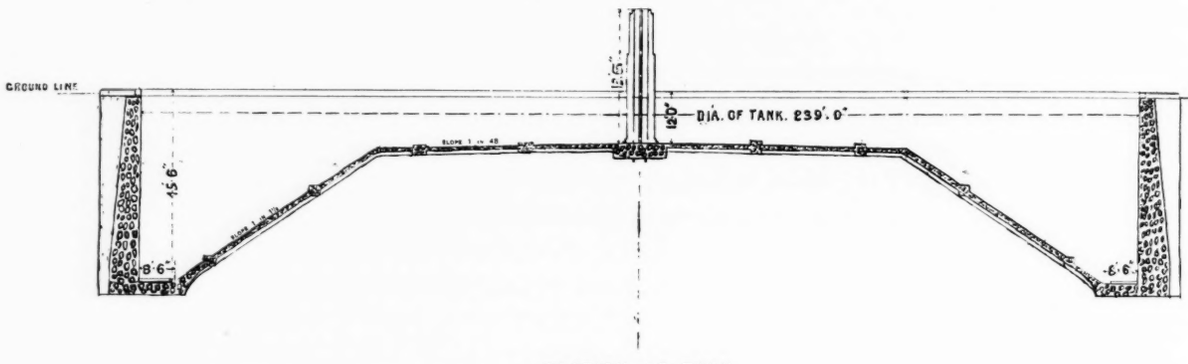


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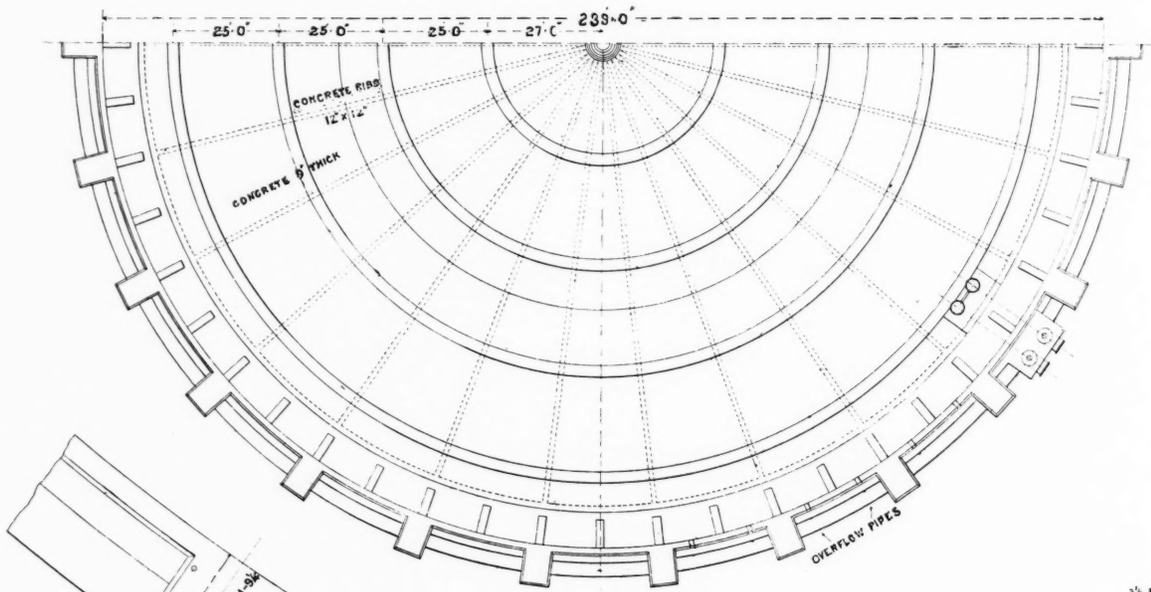


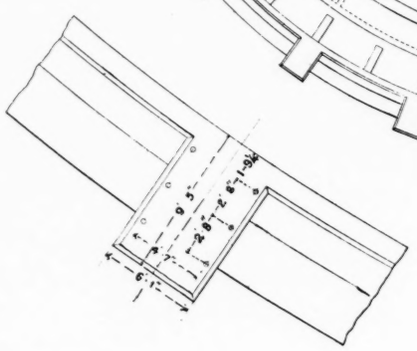


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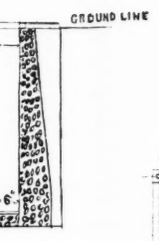

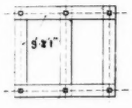

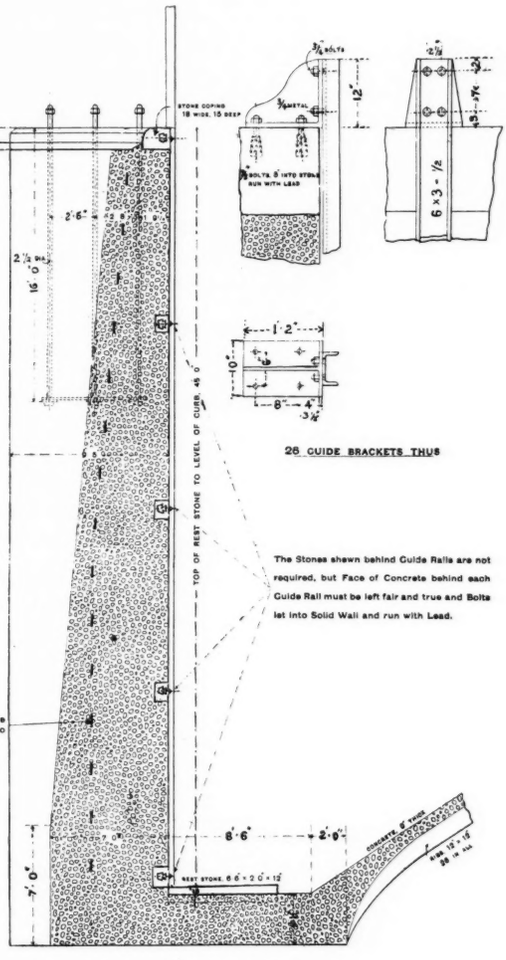








26 GUIDE BRACKETS THUS

The Stones shewn behind Guide Rails are not required, but Face of Concrete behind each Guide Rail must be left fair and true and Bolts let into Solid Wall and run with Lead.

15 Wall Ties 6 × 3⅜ right round the Tank, to be made in Lengths to suit the Tank Contractor

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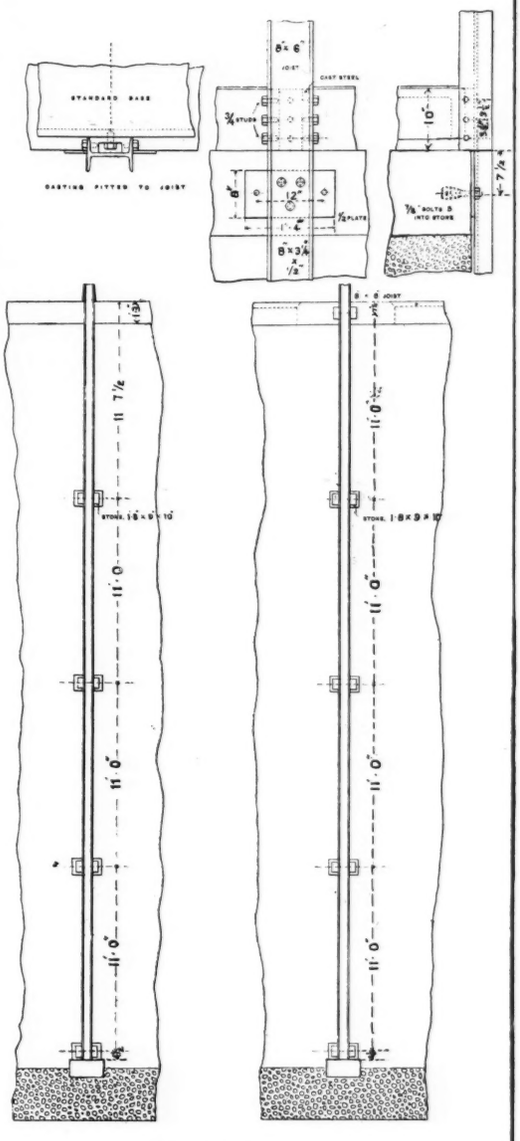


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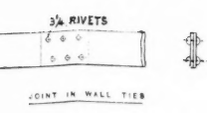


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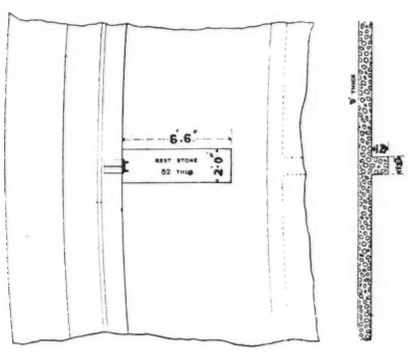


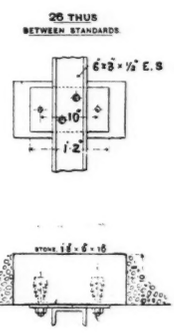


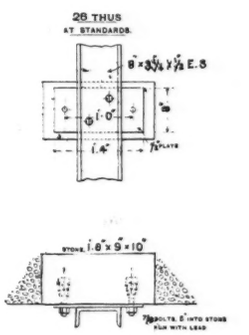


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Bills read the third time and passed: Aspatria, Silloth, and District Water Bill [Lords], Newcastle-upon-Tyne and Gateshead Gas Bill [Lords], New Swindon Gas Bill [Lords], Rhyl Improvement Bill, Shrewsbury Gas Bill [Lords], Sutton-in-Ashfield Urban District (Water) Bill [Lords], Winsford Urban District (Gas Transfer, &c.) Bill.

Last Thursday, on the motion of Mr. Strachey, the Select Committee on the Barrow-in-Furness Corporation Bill were instructed to insert the following clause, making the operation of a superannuation or provident fund contingent upon the registration of the Corporation under the Friendly Societies Act, 1896: "Any scheme for the establishment of a superannuation or provident fund under this part of this Act shall not come into operation until the Corporation shall, in respect of that fund, have been registered under the Friendly Societies Act, 1896; and the provisions of that Act, except the proviso to sub-section (1) of section 8 and section 41, so far as they are applicable, and are not inconsistent with the provisions of this part of this Act, shall apply as if (*a*) the Corporation were a society to which that Act applies and were the Trustees of such society; (*b*) as if the scheme were the rules of such society; (*c*) as if the superannuation or provident funds were the funds of such society; and (*d*) as if the contributors to the fund were the members of such society." A clause in similar terms is being inserted in other Corporation Bills.

## HOUSE OF LORDS COMMITTEE.

### Wednesday, June 26.

(*Before Lord* BROUGHAM AND VAUX, *Chairman*, *Lord* ABINGER, *Lord* WOLVERTON, *Lord* MANNERS, *and Viscount* MONCK.)

ALDERSHOT GAS AND WATER BILL.

To-day the above-named Committee commenced consideration of this Bill, the objects of which are to confirm an agreement for the sale to the Aldershot Gas and Water Company of the undertaking of the Yorktown and Blackwater Gas and Coke Company, Limited, to extend the limits of supply, to empower the Company to take land for the storage of gas, and to raise additional capital. The Bill has already been passed by a Committee of the House of Commons, the proceedings before whom were fully reported in the "JOURNAL" for May 7 last (p. 1242).

Mr. CLAUDE BAGGALLAY, K.C., and Mr. HUTCHINSON appeared for the promoters; the Hon. J. D. FITZGERALD, K.C., and Mr. G. J. TALBOT represented the Aldershot Urban District Council. The Yorktown and Blackwater Gas and Coke Company also presented a petition against alterations and amendments.

Mr. BAGGALLAY, in opening, said that, under a Provisional Order obtained in 1890, contrary to the usual custom, the sliding-scale was not fixed at the variation of 5s. per cent. in dividend for every 1d. variation in the price of gas, but at 3s. This was because part of the profits were obtained from gas and part from water, and it was almost impossible to separate the capital. At present the Company had exhausted all their capital powers, with the exception of a sum of £10,196 which they might borrow. The agreement for the purchase of the Yorktown concern was scheduled to the Bill. The consideration was to be £16,000 in cash. Of this sum, £15,000 was to be applied to paying the debts of the Company and other expenses—the balance to be divided among the shareholders in the selling Company—and £1000 was to be paid as compensation to the Directors and Secretary of the Company. Further, the Aldershot Company were to take over, and discharge the liabilities of, the Yorktown Company in respect of £1000 of debenture bonds. The total price, therefore, was to be £17,000. At the present time, the two Companies had concurrent powers of supply in an area which jutted into the district in which the Aldershot Company had solely the right of supply. If the Company effected the purchase, they proposed to take further powers to supply certain parishes to the east, who did not object. These parishes formed a lean district. They could not supply themselves; and they had no chance of getting gas at all on favourable terms, unless in connection with an undertaking of considerable magnitude. It was not proposed to alter the water limits in any way. Clause 9 authorized the charging of a higher price for gas in the outside districts than in the present area; the reason being that the lean parts could not be supplied at the same rates as the more populous portion. The difference was not to be greater than the present actual difference—namely, 1s. per 1000 cubic feet. Then, in order to prevent the price being raised in Aldershot, it was provided that for seven years not less than 6d. more than in Aldershot should be charged outside. It was to the interest of the Company to keep the charges in Aldershot low, because on these charges, under the sliding-scale, depended the dividends they could declare. Counsel then turned to the petition of the Aldershot Urban District Council, whose chief objection was to the proposed acquisition of the Yorktown Company and the extension of the limits of supply, which they held would impose on the Company obligations which would interfere with the proper and effective carrying out of the duties of the Company within their present district. They said the terms of acquisition were unusual and unreasonable; that the price was excessive; and that the loss which must result would materially affect the price of gas within their district. They contended that the differential rate proposed was inadequate and unsatisfactory, and the present supply of gas inefficient and defective. They also submitted that the further capital proposed of £120,000, with power to borrow £30,000 more, was in excess of requirements, and should not be sanctioned without providing for a proper division of the capital expended on the gas-works and the water-works. The Council also made various allegations with regard to the water undertaking, and as to other points of detail.

Mr. *A. F. Wilson*, Chairman of the Aldershot Gas and Water Company, explained the necessity for purchasing the undertaking of the Yorktown Company, and the manner in which the agreement was drawn up. He said that the agreement, if carried out, would be advantageous to the consumers and inhabitants of both Aldershot and Yorktown. After the transfer, the Company would carry on the manufacture of gas at their central station in Aldershot, and only retain the Yorktown works as a stand-by in case of necessity, and for storage. Undoubtedly the Company, after the transfer, should be able to charge a higher price in the outlying district than in Aldershot, because of the leaner nature, from a gas point of view, of the outer area. The price of gas was increased last year in Aldershot from 2s. 6d. to 3s. per 1000 cubic feet, owing to the increase in the price of coal; but they anticipated being able to make a reduction soon. The present prices for water were the result of a bargain with the Urban District Council. The Company gave a constant supply, even to the highest parts of the district. With regard to the suggested separation of capital, he said the sliding-scale relation of 3s. increase or decrease of dividend as the price of gas was raised or lowered by 1d., instead of the usual scale (which would be more favourable to the Company) was fixed because the gas and water capitals were intermixed, and not separated. No objection had hitherto been taken to this mixing of the capital. He knew of no advantage which would accrue from separating it; whereas many disadvantages would follow. The Company had no objection to the District Council setting up a separate testing-station at their own expense if they desired to do so; but the Company objected to establishing another, as they already had one at the works, where continuous records were kept, which were always open to inspection by the Urban District Council.

In cross-examination by Mr. TALBOT, witness said the initial object of the Bill was the purchase of the Yorktown concern, the capital of which was £6915. It was suggested to witness that, according to the profit shown on the Company's balance-sheet, the cash payment proposed of £16,000 was 45 years' purchase. Witness replied that the Company did not accept the balance-sheet as correct. It might be that, even on Mr. Corbet Woodall's estimate of the profits, the £16,000 amounted to 33 years' purchase. He had no information as to whether, in 1899, the £2 10s. shares of the Yorktown Company fetched only £3 2s. It was possible, if the purchase took place, that each £2 10s. share would receive as its portion of the purchase-money £5 8s. 5d. He should take that sum to be the potential value of the shares. The Aldershot Company raised money at an average of 4 per cent.; and thus, on the £20,000 required for the purchase, there would be an annual charge of £800. There was nothing to prevent a loss on the gas undertaking being thrown on the consumers of water; but there was no loss on either branch of the business.

Re-examined: Compared with the North Camp and Farnborough purchase, the present purchase of the Yorktown Company was more advantageous to the Aldershot Company. In the North Camp case, the purchase price was £16,600, and the make of gas nearly 12 million cubic feet, which worked out at £1355 per million; while in the Yorktown case £17,000 was to be paid for a make of 16¾ million cubic feet, which equalled £1020 per million. The present consumption of the North Camp district was 30 million cubic feet; and a similar increase was anticipated in the Yorktown area.

Mr. *Corbet Woodall*, examined by Mr. HUTCHINSON, said he regarded the terms of purchase of the Yorktown Company as satisfactory. The present dividends of the Company were not a fair basis on which to estimate the value, because they were not paying full dividends, though earning them. If the Company had chosen to pay full dividends, the argument about the number of years' purchase would have fallen to the ground.

By the CHAIRMAN: His experience of the result of electric lighting competition was that it did not materially affect the value of gas properties. Never had the increase in the demand for gas approximated to what it had been in the last four or five years.

Further examined: By corrections, he increased the balance on the revenue account of the Yorktown Company for 1899 from £343 to £477. In fixing the price, this sum was multiplied by 28½, and 10 per cent. was added in respect of the increased consumption which it was estimated would occur between that year and 1900, which year would be the one when the transfer would take place. This produced £14,953—say, £15,000. In addition, the Yorktown Company had recently erected a gasholder very much in excess of the then necessities of the town; and £1000 was added for that, which raised the figure to £16,000. It was therefore considered that £17,000 was not, having regard to the growing character of the district, an excessive price. The purchase at this figure was advantageous to consumers in both Yorktown and Aldershot. As a fact, the increase in 1900, instead of 10 per cent. at which it was estimated, was actually 13·3 per cent. There was no doubt whatever that the cost of making gas on the larger scale at Aldershot would be very much less than on the smaller scale at Yorktown. The cost of making gas at Yorktown in 1899 was 2s. 9d. per 1000 cubic feet; while at Aldershot it was 1s. 3d. In 1900, the difference was less. He agreed that the pressure in the Company's mains had been excessive; but this was being limited now, and would certainly not obtain in future. When the sliding-scale was fixed by the 1890 Order, the Local Authority had due cognizance of it, and did not offer objection. He regarded the proposed extension of the limits of supply in the interest of the Company and of the localities. If the localities were to undertake to supply themselves, they would inevitably in the end get absorbed by the larger undertaking, which could supply gas cheaper. The clause in the Bill giving a differential price had been inserted on the initiative of the House of Commons; and to his mind it equitably met the merits of the case. If there was reason to apprehend that the interests of Aldershot would suffer, the provision giving not less than 6d. above the Aldershot price in the outside districts for seven years was ample protection. As to capital expenditure, he believed that the amount taken was too small, and the Company would have to come back to Parliament in about another five years. The expenditure would be £600 per million cubic feet of gas supplied. They had estimated, on the basis of the present output, for 154 million cubic feet, and had allowed for expected increase. This would require £92,400 to be expended on gas-works, and to this was to be added the amount necessary for the purchase of the Yorktown undertaking, which was nearly £20,000 in all—making £112,000. To the total capital of £150,000 mentioned in the Bill, there had to be added £20,000 in hand, making £170,000. Deducting the £112,000, left roundly £60,000 for working capital.

In cross-examination by Mr. TALBOT, witness agreed that the Yorktown Company and the Aldershot Company both had power to supply in a certain area which was being purchased; and no doubt this argument, if an arbitration had taken place, would have been used as a reason for reducing the purchase price. To a slight extent, it would be taken into account. If there was any loss on the outside districts beyond the 1s. per 1000 cubic feet for which provision was made, it would have to be paid by the Aldershot consumers; but no such loss would occur. He agreed that there were very few cases where companies supplying gas under a sliding-scale also furnished water. The only instances he knew were the present and Bournemouth; and in the latter, the result seemed to have been eminently satisfactory to the consumers. There would be difficulty in separating the capital. It was not unreasonable to urge that the water charge might be maintained in order to lower the price of gas; but the answer to that was that both charges now stood on a parity.

By the COMMITTEE: Compensation was not invariably paid to directors and secretaries; but it was usual to do so.

Mr. *David Spaswell*, a Director of the Yorktown Company, gave formal evidence as to the agreement having been approved by the shareholders of the Company.

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### Thursday, June 27.

Mr. *E. B. Taylor*, examined by Mr BAGGALLAY, said the greatest quantity of water the Company had been called on to supply in 24 hours had been 1,400,000 gallons. Undoubtedly, plenty of water could be obtained from the chalk. The Company pumped continuously, and by this means gave a constant supply to the highest part of the district. The charges under the Act of 1896 were very moderate, and lower than those of similar undertakings. Further capital to the extent of £40,000 would have to be spent in a year or two; and this would carry the water undertaking on for about ten years.

Cross-examined: The water charge for houses at Aldershot under £50 was 6 per cent. on the rack rent—that was about 7 per cent. on the rateable value. He did not know that in similar companies the charge was about 5 per cent. Owing to the operation of the sliding-scale in reference to gas, it was to the interest of the Company never to reduce the water charges.

This closed the evidence for the promoters.

Mr. HARPER said he appeared for the Yorktown and Blackwater Company, to petition against alterations. If the Committee wished to make any changes, he would ask for an opportunity to be heard.

The following evidence was then called for the District Council.

Mr. *E. H. Stevenson*, examined by Mr. FITZGERALD, said that the Aldershot Company already had the right to supply in all the profitable portions of the Yorktown district. The accounts of the Company had not been kept in the form required by the Gas-Works Clauses Act of 1871; and it was impossible to say from them what the exact profits were—the capital expenditure being mixed up with revenue expenditure. The Company's balance-sheets showed their profits in 1898 to have been £317, in 1899 £343, and in 1900 £347. The principal items in valuing a gas undertaking were the right to supply and the works. In this concern, the two principal elements of value were not being acquired. There was no goodwill, because the buying Company already had the right to supply in the area; and none of the works, except the gasholder and mains, were apparently going to be used. The figure of £477, the profits for 1899, should be corrected by deducting £40 for interest on debentures, and £156 in respect of the reduction which the Company made that year in the price of gas. This would diminish the profit to £281. Corrected for arbitration purposes, the profit for 1899 would be £397, and for 1900 £271. The fact that the shares were sold in 1899 at a premium of 12s., and that by the proposed purchase the shareholders would receive a premium of nearly £3 per share, showed that the price was too high. Aldershot was almost the sole source of water revenue, and by far the largest source of gas revenue; and if there was a considerable loss on the purchase of the Yorktown Company, this would ultimately fall on the Aldershot consumers of gas and water. He thought there would be a loss. Besides the high price the Aldershot Company were giving, they talked of reducing the price of gas by 6d. per 1000 cubic feet, beginning next year, to meet which they would have to earn a further £500 per annum. Under the Company's sliding-scale, he calculated that for every £1 shareholders would receive when a reduction in the price of gas took place, the consumers would receive £16.

In cross-examination by Mr. BAGGALLAY, witness said he did not think it would be generous of the Aldershot Company to go into competition with the Yorktown Company, in the best part of their district, so as to depreciate it in value, and then buy it cheap. He knew of no power by which the Aldershot Company could be made to supply in the area common to both Companies. The capital expenditure of the Yorktown Company had been about £10,000, and the sale of gas about 15 million cubic feet, which worked out to about £666 per million sold. In valuing the undertaking for an arbitration, if he were acting for the owners he would not claim for works provided out of profits, even if the Company were paying full dividends. If the purchase were effected, there would be some saving in manufacturing all the gas required at the central works; but against this there was to be set the further capital expenditure at the central works and on mains to carry the gas to the outer area. He did not regard the purchase as reckless from the Aldershot Company's point of view.

Re-examined: From the commencement, the Yorktown Company had been subject to the competition of the Aldershot Company, which must always reduce their value in the eyes of any purchaser.

Mr. *T. F. Wells*, Chairman of the Aldershot Urban District Council, said he, the Council, and the great majority of the ratepayers of Aldershot, were opposed to the purchase. As an ordinary business man, it appeared to him the price was excessive. It had long been the view of the Council that the water supply of Aldershot should be in the hands of the Local Authority. To acquire the water-works they might find it necessary to purchase the gas concern also; but the extension of the district by the purchase of the Yorktown Company would effectually prevent the Council ever doing this. The capital would be increased to such an extent as to render it impossible.

Cross-examined: The Council had let their contract for the installation of the electric light; and it was to be completed in two years. He did not think the price of gas would be reduced to meet the competition of electricity.

Mr. *C. A. Calvert*, Chairman of the Special Gas Committee of the Aldershot District Council, confirmed the last witness.

Mr. *Friend*, an architect of Aldershot, said there had been very considerable dissatisfaction in the district with regard to the supply of gas. He personally had complained for the last four or five years.

This closed the evidence.

Mr. FITZGERALD, for the District Council, said the real question to be determined was whether the proposed purchase should be sanctioned by Parliament. There were two principal elements which represented more than half the value of a concern. The first was the goodwill or right to supply. As a general rule, the company bought had for all practical purposes a monopoly; and the purchasing company obtained that monopoly. The second was the manufacturing works by which the purchasing authority or company intended to supply. Here these two main elements of value were absolutely wanting. This being so, the purchase would be extravagant if the Aldershot Company were only paying what would be the ordinary rate; but they were paying far more than that. It was difficult to see why the purchase was necessary. If the Aldershot Company wanted to sell gas in the district, they had power to do so, as was shown by the fact that they were now giving a supply to a small portion of it. If they desired to take their mains through the district, to supply their own area beyond, they had the power to do this; and there was no obligation to give a supply *en route*, except to persons within 50 yards. The Yorktown Company took their powers from Parliament knowing there was possibility of competition. This possibility lessened the value of the concern; and it ought to be considered in any contemplated purchase. If the purchase were extravagant and improvident, he submitted it ought not to be allowed by Parliament. On the most favourable basis, Mr. Woodall's figures worked out to 35 years' purchase, which was more even than the Gaslight and Coke Company of London would ask; and on Mr. Stevenson's figures, the Aldershot Company were giving from 45 to 60 years' purchase, which was absurd. What public case was there for doing anything of the kind? He strongly suspected that one idea in the mind of the Aldershot Directors in pushing the purchase was that if they secured these new capital powers and extensions of their district, they would be better able to resist any proposals by the Local Authority to acquire the undertaking.

Mr. BAGGALLAY, in reply, said the opposition which was offered to the purchase of the Yorktown Company was not the *bonâ fide* opposition of the Aldershot Council, but was opposition offered under the advice of Mr. Stevenson. He believed the only question was as to whether the £17,000 provisionally agreed to be paid was justifiable. He asserted that it was, and that it would be to the advantage of the district that the transfer should take place, because there was not the slightest doubt that the almost immediate effect would be a great increase in the consumption, and consequent reduction of price.

The room was then cleared while the Committee considered their decision. On the re-admission of the parties,

The CHAIRMAN said: The Committee are of opinion that the preamble of the Bill as regards the purchase of the Yorktown Gas-Works is not proved. They are also of opinion that the further capital proposed to be raised by the Bill should not exceed the sum of £50,000.

Mr. BAGGALLAY asked if the Committee meant £50,000 with the usual borrowing powers.

The CHAIRMAN said the promoters asked for capital powers as to £120,000. The Committee wished this to be reduced to £50,000.

Mr. HARPER asked for the insertion of a provision that neither the capital now authorized, nor any unexhausted capital powers which the Company might now have, should be used to compete with the Yorktown Company in the area where that Company and the Aldershot Company had common powers of supply. The Committee would recollect that the promoters had themselves said such competition would be unfair.

Mr. BAGGALLAY submitted that the Yorktown Company had no *locus standi*.

The Committee upheld the submission.

Mr. FITZGERALD asked for the insertion of the following clause in substitution for clause 11 of the Bill: "Within six months from the passing of this Act, the pressure in the distributing gas-mains of the Company shall be so regulated as not to exceed 2 inches at the meter." The provision put in when the Bill was before the House of Commons—"Within six months from the passing of this Act, the pressure in the distributing mains of the Company shall be so regulated as to conform to what is normal and customary, having regard to the necessities of the parish of Aldershot"—seemed to do nothing. Apparently, the clause would enable the Company to contend that what they had been doing, and what the Council complained of and wanted to remedy—namely, the excessive pressure—was a thing to be maintained.

Mr. BAGGALLAY said the Model Bill, which had been followed in this case, required a certain minimum pressure to be given; but there was no requirement as to a maximum. Clause 11 of the Bill was a novel clause put in by the House of Commons, and was without precedent. As it had been put in by the Commons Committee, he was bound to stand by it; but if the Council wished it struck out, he would not object. The Board of Trade had approved of the clause as giving effect to the decision of the Committee. He was told there would be great difficulty in working to the requirement that the pressure should be 2 inches at the consumers' meters.

Mr. FITZGERALD agreed that the clause he proposed was unprecedented, but the circumstances were most unusual; the peculiarity being that, whereas in the Model Bill provision was made for a minimum pressure, in this case the Company had been giving a quite unprecedented pressure—viz., from 4½ to 7 inches, the ordinary pressure being about 8-10ths. He agreed that there might be inconvenience if the pressure were gauged at the consumers' meters; and he would

therefore be prepared to take the pressure as at the meter at the testing-station.

Mr. *Harry Woodall* (in the absence of Mr. Corbet Woodall) explained to the Committee that if the Company were obliged to send out gas at not more than a certain pressure, it might cause difficulty by preventing them from sending it out at a higher pressure, and then reducing it at various points for the convenience of the consumers. It was now a very usual thing to force gas at considerable pressure through mains, and then reduce it by district governors; so that the consumers received it at a proper pressure. He did not say the Company would want to do this. The provision would be most awkward to work.

The CHAIRMAN: I would throw out as a suggestion that clause 11 in the Bill should stand, but that the words "having regard to the necessities of the parish of Aldershot" should be left out.

Mr. BAGGALLAY: I do not object to that.

Mr. FITZGERALD: It is not exactly what we wish; but we accept the suggestion.

It was accordingly agreed that the clause should be amended in this manner.

Discussion then took place on the suggestion of Mr. Fitzgerald that the Company, at their own expense, should provide a new official testing-place away from the works. Eventually, the Committee decided that the Council should be permitted to put up a new official testing-place at their own expense.

After argument, the following clause was also agreed to: "The Company shall keep separate accounts of the receipts and expenditure for gas and water purposes respectively on capital and revenue account, and shall apportion between those accounts any expenditure incurred for purposes common to both."

## HOUSE OF COMMONS COMMITTEE.

### Thursday, June 20.

(*Before Sir* JOHN KENNAWAY, *Chairman*, *Mr.* J. H. ROBERTS, *Mr.* HELME, *and Mr.* SPEAR.)

LONDON UNITED TRAMWAYS BILL—ELECTROLYSIS OF GAS AND WATER MAINS.

To-day, the above Committee found proved the preamble of a Bill promoted by the London United Tramways Company, so far as it related to a group of tramways at Surbiton, and to a tramway from Kew Bridge to Richmond. They also stated that they were prepared to give powers to the promoters to construct a tramway from Kensington Road over Hammersmith Bridge, subject to conditions of reverter on reasonable terms to the London County Council in 1909. All these lines will be worked on the trolley system of electric traction. The promoting Company sought powers in regard to other lines; but they were not granted.

Mr. BALFOUR BROWNE, K.C., the Hon. J. D. FITZGERALD, K.C., and Mr. LEWIS COWARD, K.C., appeared for the promoters; Mr. PEMBER, K.C., Mr. CLAUDE BAGGALLAY, K.C., and Mr. F. W. PEMBER represented the Chelsea Water Company. The New River, Grand Junction, West Middlesex, Lambeth, and Southwark and Vauxhall Water Companies entered an appearance, but were not represented by Counsel.

Mr. BALFOUR BROWNE, after the decision of the Committee had been announced, opened the case of the promoters with reference to petitions presented in opposition by several of the Metropolitan Water Companies. At the outset, he read the material portions of clause 12 of the London United Tramways Act of 1899, which contained special provisions as to the use of electrical power, and which it was proposed to incorporate in the Company's present Bill. They were as follows:—

As from the passing of this Act, section 45 (for protection of Kew Observatory) and section 46 (special provisions as to use of electric power) of the Act of 1898 are hereby repealed; and the following provisions shall apply to the use of electrical power under the Act of 1898 and this Act, unless such power is entirely contained in, and carried along with, the carriages:—

(1) The Company shall employ either insulated returns or uninsulated metallic returns of low resistance.

(2) The Company shall take all reasonable precautions in constructing, placing, and maintaining their electric lines and circuits and other works of all descriptions, and also in working their undertaking so as not injuriously to affect by fusion or electrolytic action any gas or water pipes or other metallic pipes, structures, or substances, or to interfere with the working of any wire, line, or apparatus from time to time used for the purpose of transmitting electrical power, or of telegraphic, telephonic, or electric signalling communication, or the currents in such wire, line, or apparatus.

(3) The electrical power shall be used only in accordance with the Board of Trade regulations; and in such regulations provisions shall be made for preventing fusion or injurious electrolytic action of, or on, gas or water pipes or other metallic pipes, structures, or substances, and for minimizing, as far as is reasonably practicable, injurious interference with the electric wires, lines, and apparatus of other parties and the currents therein, whether such lines do or do not use the earth as a return.

(4) The Company shall be deemed to take all reasonable precautions against interference with the working of any wire, line, or apparatus if, and so long as, they adopt and employ at the option of the Company either such insulated returns or such uninsulated metallic returns of low resistance, and such other means of preventing injurious interference with the electric wires, lines, and apparatus of other parties and the currents therein as may be prescribed by the Board of Trade regulations; and in prescribing such means, the Board shall have regard to the expense involved, and to the effect thereof upon the commercial prospects of the undertaking.

The tramway was to be worked by the overhead or the conduit system, so that the clause would apply to them. It would give absolute protection to the Water Companies, who, if they succeeded in putting on the promoters the obligation to provide an absolutely insulated return, as they might seek to do, would render these lines commercially impossible. The clause proposed was the result of a very careful inquiry by a Joint Select Committee of the two Houses of Parliament presided over by Lord Cross. Anybody who kept a wild animal was responsible at common law if it escaped and did any damage. But this common-law principle had not been acted upon by Parliament in relation to its own creatures—railways, tramways, &c. All that such bodies were required to do was to exercise, with due diligence and caution, the powers given by Parliament; and having done this, they were not responsible for any damage which might follow. When electricity was first used, the earth was depended on to a certain extent for the return current. Thus, the Post Office depended entirely on the earth. Counsel went on to explain how disputes in regard to the matter led to the appointment of Lord Cross's Joint Committee, who went into the whole subject, both with regard to the disturbance of current by leakage and with regard to electrolytic action on fusion, and, after hearing the municipalities and companies concerned, drafted a clause for insertion in all Tramway Bills for the protection of gas and water companies. This clause was the one the promoters had adopted. The petitioners, however, wanted something more. They were afraid of fusion or electrolytic action taking place when the current left the pipe. If the rails were laid in absolutely dry rock, it was well known there would be no escape; but if the rail were in contact with very moist earth, especially if the earth contained salt, stray currents would get away from the rails, and these might take the homeward route by means of the water-pipes. All this, however, was known long before the clause was drafted and the matter gone into by Lord Cross. The protection against it was afforded in two ways. First, the Tramway Company were bound to use the best practical means to avoid it; and, secondly, they were only to work under the Board of Trade regulations, which regulations fully protected the pipes. There were various devices by which the current could be taken home without doing any harm whatever to the pipes. All electric tramway rails were at the present time bonded together by copper, in order to facilitate the homeward passage of electricity along the rails. If the petitioners chose to bond their pipes to the Tramway Company's rail near the home station, no electrolytic action could take place; so that the Water Companies could protect themselves. Further, if there were not a large difference of potential between one end of the line and the other, the stray currents would have little or no effect; and the Board of Trade regulations said there was not to be a greater difference of potential in the currents from one end to the other than 7 volts. The Board of Trade had put upon the promoters conditions which were sufficient to give perfect protection. If the promoters did not afford protection by all the means indicated by the Board of Trade, they would be liable to pay damages. Turning to the precedents, he said that in the London County Council Tramways Bill of last year, some of the Companies succeeded in getting a special clause; but this was not a precedent against him, because the County Council tramways were run by the conduit system, under which it was easy to give a metallic return, and thus prevent all electrolytic action. With overhead wires, it was, practically and commercially, impossible to give a metallic return. The only precedent against him was that of the Sheffield Corporation, who, when seeking to extend their tramways, were opposed by the Gas Company, who succeeded in obtaining a clause to the effect that, if they could prove that the tram system had caused fusion or electrolytic action, the Corporation should be responsible, and should give compensation. On the other hand, in the case of the Bexley Tramways Bill the local Water Company and the South Metropolitan Gas Company raised a similar contention. The Commons Committee considering the Bill called before them the Board of Trade officials—the late Sir Courtenay Boyle and Mr. Trotter, the Electrical Adviser to the Board. Both gentlemen stated that they believed Lord Cross's clause was amply sufficient, and, further, that if anybody pointed out where it was not sufficient, they would make other regulations. The Committee thereupon refused to give the Sheffield clause which was sought. Exactly the same thing took place in the case of Croydon last year. Since the Bexley instance, the South Lancashire Tramways Bill had been in the Lords, when the Bury Water Board, who supplied water in a large district of Lancashire, sought more than the model clause. The matter was argued at length before Lord Ducie's Committee, who refused the petitioners' request. There was therefore one case in which further protection was given, and three in which it was not. He did not believe anybody could produce a single case of electrolysis taking place where a tramway had been properly worked under the Board of Trade regulations.

### Friday, June 21.

The CHAIRMAN: I gather, Mr. Balfour Browne, that you say the existing protection is sufficient; and, if not, the Board of Trade have power to adapt the regulations to the new discoveries of the time?

Mr. BALFOUR BROWNE: That is so.

The CHAIRMAN: And the Water and Gas Companies affected have a right of appeal to the Board of Trade?

Mr. BALFOUR BROWNE: Most assuredly.

Professor *Silvanus P. Thompson*, examined by Mr. BALFOUR BROWNE, said he had studied the questions arising from the effects of electric currents flowing in conductors, and of those flowing from one conductor to another; and he had a familiar knowledge of the circumstances under which electric currents flowing out of or into a metal conductor produced corrosion and other chemical action. The action caused by the flow of an electric current was called electrolysis. So long as the electric current flowed along in a metal conductor, and was confined to the conductor, it produced no chemical action. To produce electrolysis, the electric current must pass out of the metal conductor into liquid or into moist soil. A different chemical action was produced on the current re-entering metal. Electrolysis only occurred at the place of transmission where the current left or entered the metal. The action differed, however, in the two cases. Corrosion or solution of the metal occurred at the surface on exit. At the surface on re-entrance, instead of solution or corrosion, there was a tendency to produce a deposit. There was no deposit or corrosion so long as the current flowed in metal.

Mr. BALFOUR BROWNE: What does the amount of corrosion depend upon?

*Witness:* The strength of the current at the time the current is flowing

In a place where electric current may be leaving an iron tram-rail embedded in moist soil, what effect would a current of 1 ampere produce in a given time?—A current, strength 1 ampere, lasting for an hour, under the most favourable circumstances, would remove about 15 grains of the iron from the rail.

That is the maximum under the most favourable circumstances?—Under the most favourable circumstances. The nature of the soil has a great deal to do with it.

Does saline water form a better conductor than ordinary fresh water?—Certainly. Any salines or alkalines or acids increase the conductivity, and increase electrolytic action.

As to the figure of 15 grains an hour. You would not expect to find that occur in connection with any tram-rail in a street?—It might.

But that is the worst that could happen?—Yes.

In further examination, witness said he had the means of showing a very simple experiment, which would illustrate the fundamental point of the case. He had prepared two glass tanks. [The tanks were placed on the table before witness.] One tank, he said, contained sand and salt water. There were embedded in it, at a distance from one another, two pieces of common iron gas-pipe; and a current introduced by wire into one was caused to flow from the first piece to the second. It would be found, when taken out, that the piece of metal by which the current entered the moisture was corroded; and the other, where the current entered the metal, was not. [Witness took the pieces of metal from the sand, and showed that the effect was as he stated.] Continuing, he said that in the second tank there were also sand and salt water and some other pieces of pipe; but they were bonded together with metal. On a current being sent into one and taken out of the other, there was no corrosion of either; the reason being that the current did not leave the pieces of pipe, but passed from one to the other by means of the metal bond.

Mr. Balfour Browne: In the case of current returning through an iron tramway rail, it has to pass along a long length of rail, and there is inevitably produced a fall in potential between the two ends of the rails?

*Witness:* Yes.

Is that due to the resistance offered to the passage of the current?—Yes; the rail offers a certain amount of resistance. The higher the resistance, the greater the fall of potential. Unless special devices are provided, the rails at the part of the line most distant from the generating station will be of higher potential by a few volts than the rails at the other end; and if you have a higher potential at one end than the other, the tendency is to leave that which is high, and get at that which is low. In order to prevent a large departure of electricity from the conductors, the fall of potential must be kept small, and it was limited by the Board of Trade regulations to 7 volts; the object of the restriction being that the tendency to leak or stray might be minimized. If the fall of potential were excessive between any two points in a rail, a large fraction of the current, instead of going back to the rail, would leave the rail and find for itself some stray paths through the earth.

And in taking stray paths through the earth, it might chance upon a conductor (such as a water-pipe) and come along that?—Certainly; and where it went into the pipe, if it did anything, it would deposit something. It certainly does not take anything from the pipe where it enters it. There is no corrosion where it enters the pipe.

In your view (not alone, but taken in connection with the other regulations of the Board of Trade) does that give protection to the water-pipes?—It would not give protection alone; but with the other regulations it does. The other regulations amount really to this—that, though a 7-volt drop in the potential may be allowed on the system as a whole, there must not be a greater drop on one line than something much less than 7. I will read the regulation. Paragraph 6 has two parts: "(1) The current passing from the earth connections through the indicator to the generator shall not at any time exceed either 2 amperes per mile of a single tramway, or 5 per cent. of the total current output of the station. (2) If at any time, and at any place, a test be made by connecting a galvanometer or other current indicator to the uninsulated return and to any pipe in the vicinity, it shall always be possible to reverse the direction of any current indicated by interposing a battery of 3 Leclanché cells, connected in series, if the direction of the current is from the return to the pipe, or by interposing 1 Leclanché cell if the direction of the current is from the pipe to the return." No. 7 is: "When the return is partly or entirely insulated, a continuous record shall be kept by the company of the difference of potential during the working of the tramway between the points of the uninsulated return furthest from, and nearest to, the generating station. If at any time such difference of potential exceeds the limit of 7 volts, the company shall take immediate steps to reduce it below that limit." That fixes the absolute minimum quantity of electricity that can return to a given mile of tramway. It also fixes another thing. The current allowed to stray back through the earth is not to exceed 5 per cent. of the total output of the station. Part (2) of paragraph 6 really provides an inspector with a simple experimental means of testing, by using a galvanometer and a Leclanché cell, whether there is or is not an amount of fall of potential likely to cause damage. That can be carried out quite easily in a very few minutes. All you require is to connect one wire with the rails and to carry the other to something in connection with the gas or water main—say, a tap.

Are there different methods by which it is easy to prevent any deleterious electrolytic action upon gas or water mains?—Yes. The first is by reducing the resistance in the rails by bonding. That reduces the resistance.

Besides that, is it quite possible, by means of a bond from the pipe carrying the current, to take back the current to a negative pole at the generating station?—Yes.

If that were done, there would be no corrosion at all?—Not if it were done suitably. I do not think it is necessary to be done if you are working under the Board of Trade regulations. But it can be done; and it would be an absolute protection at the place where corrosion is most likely to occur.

The Chairman: To do that, you would have to put a conductor somewhere in all the water-pipes near your generating station or the chief main?

*Witness:* At the nearest point to the generating station you would have to make a metallic connection with the water-pipe by a good copper bond, which would carry the current back to the station.

Mr. Balfour Browne: Then you have a metallic track back from the rail to the station?

*Witness:* It is provided for in clause 8 of the Board of Trade regulations.

Besides that, can you also facilitate the return of the current without damage to the pipe by what are called return feeders?—Yes; that is regularly done. In order that the whole of the current shall not have to flow along, possibly, some miles of rails back to the generating station, it is usual to provide, at certain points at distant parts of the line, return feeders. You tap the returning current, draw it off, and bring it back. The rails would carry nearly all; but there would be such a fall of potential if all the current came back by the rails, that there would be a tendency to leak.

There is also one other means by which it could be prevented—a negative booster?—Yes; a negative booster is an electrical device which sucks away automatically the returning current to a feeder; and this enables you to lower the potential to any extent you please.

Witness at this point exhibited a model consisting of two lines of brass rails embedded in a moist bed of blotting-paper, wetted with brine, and an iron pipe laid on the same bed alongside the rails. By passing an electric current through the rails, he showed how electrolytic action on the iron pipe was produced by the passage of the current from the rails through the bed of blotting-paper to the pipe.

Mr. Balfour Browne: Have you been able to discover any electrolytic corrosion in pipes in connection with tramways which are worked under the Board of Trade regulations?

*Witness:* I have known of no such case.

In your view, are the Board of Trade regulations sufficient for the protection of the Water Companies?—I think they are.

Mr. Pember (in cross-examination): We need not bother ourselves on any question about deposit on entering. We seem to be agreed that the question is what happens on the current leaving?

*Witness:* Yes.

There is one question that seems to cover a good deal of ground. Taking the Board of Trade regulations as you have described them, do they prevent a current entering, flowing along, and leaving, a water-pipe in the neighbourhood of one of your tramways?—They do not prevent it; they minimize the amount that can so act. They keep it within bounds.

You said you do not know an instance of electrolysis where anything in the nature of a tramway like this has worked under the Board of Trade regulations. I ask whether you have heard of one instance in the Clapham Road where, quite lately (I think in May of this year) a gas-pipe was found to be corroded owing to the action of the currents from the South London Tubular Railway?—You are speaking of a railway, not a tramway on the surface.

The same regulations affect the railway as affect the tramways. Do you know that instance?—No.

Mr. Balfour Browne: I am instructed that they are not the same regulations as are applicable to the South London Railway.

Mr. Pember: Will you tell me the difference?

Mr. Balfour Browne: I will put in a witness who will.

Mr. Pember: In the meantime, I suggest that, acting under the Board of Trade regulations in the Clapham Road, in consequence of the working of the South London Railway, a gas-pipe has been absolutely corroded through.

Mr. Balfour Browne: We do not know when the corrosion took place; and we do know that for eight years that railway was worked without any regulations whatever.

In further cross-examination, witness agreed that one great difficulty in discovering what damage was being done was getting at the pipe to inspect it. Asked what security there was that the Board of Trade regulations would be observed, witness said he did not know what the legal penalties were for breaking them.

Mr. Pember quoted from evidence given by the late Sir Courtenay Boyle, to the effect that it was absolutely impossible for the Electrical Adviser to the Board of Trade to conduct anything like a general inspection of the tramways of the country. He asked witness if, supposing one of the London Water Companies' pipes was corroded through and burst, the first appearance on the scene of the Board of Trade Inspector would not be when the damage was done.

*Witness* agreed to this, and also admitted that the damage would affect the people of London generally very seriously. Even compensation to the Water Company would not be of much good to the public if the water was cut off. Bonding was not too expensive for it to be done always. Whether compulsory or not under the Board of Trade regulations, he was certain no company would avoid it. Return feeders were not compulsory, except in the sense that in a very long line it would be absolutely necessary to use them in order to comply with the regulations about the maximum fall of potential not exceeding 7 volts. Return feeders were generally, but not always, placed underground. Negative boosters also were not compulsory; but they were things which a company willingly adopted when it was necessary to reduce the potential. They were above ground. The joints on the Water Companies' mains differed immensely in their conductivity.

Mr. Pember: Is there not a tendency, wherever there is one of these joints, which is a poor conductor, for the current to jump the joint?

*Witness:* Whenever there is a resistance of any kind in the bond, there is a tendency for the current to leak round the place. Although the joints may not make good metallic connections between the pipes, they may still be perfectly good joints from the Water Companies' point of view. At a joint of high resistance, there would certainly be a tendency for the current to leave the pipe, and stray round through the earth to the pipe again.

Whenever that occurs, corrosion will go on at the point where it leaves to make the jump?—I said there would be a tendency to leave, but I do not say it would actually occur.

Will you tell me your idea of the lowest pressure at which it would bring that about on iron pipes?—I think it would require something greater than one-sixth of a volt. The smallest potential I have found capable of doing it is one-sixth of a volt.

Would you not get a current through ordinary tap water with one-hundredth part of a volt?—Not continuously, because the very first moment the current begins to flow, it deposits a film of hydrogen on re-entry, and that blocks the way.

Supposing there is a high resistance at one of the joints, would there not also be a tendency for the current to leave the pipe and go into the water inside?—Yes; if the joint was electrically bad.

If that were so, going into the water inside the pipe, it would leave the inside surface?—It might.

Then the corrosion would be inside?—Yes.

And, of course, it would not be found out until it had gone right through the pipe?—No.

In further cross-examination, witness agreed also there might be an enormous number of joints in the portion of a pipe in which electrolytic action might occur. One ampere, producing 15 grains of corrosion per hour, worked out to 14 lbs of iron per year.

Re-examined by Mr. BALFOUR BROWNE: On the South London Railway, the current was far greater than would be used for tramway traction. He had heard that for a long time the railway worked without Board of Trade regulations.

With regard to legal penalties, as I understand, the Board of Trade is not the guardian angel of the Water Companies; they must look out for themselves. Under No. 6 regulation have they not every opportunity of finding out whether any damage is being done?—Yes.

Would not the difference of potential at once suggest the necessity of inquiry?—It would. The Board of Trade regulations, and the fact that the Tramway Company would be responsible at common law if they acted outside them, would have afforded full protection to the Gas and Water Companies. Further, although the Board of Trade did not inspect, yet the Tramway Companies were compelled to keep a continuous record of the fall of potential; and if there was an abnormal fall, it was *primâ facie* evidence for inquiry.

All the Board of Trade regulations are to prevent a great fall of potential?—Yes.

If the potential were kept up absolutely, there would be no damage whatever?—That is so.

Do you know that the drop in potential of the South London Railway was shown to be 20 volts?—I thought it was higher.

The CHAIRMAN: Is that as compared with the 7 volts laid down by the Board of Trade?—A maximum of 7 volts is laid down by the Board of Trade; and it means, therefore, an average of about 3 volts.

In further re-examination, witness said that, if there were many bad joints along a line of pipes, the conductivity would be reduced. It was because the pipe, taken as a long length, was a conductor that it drew to itself stray currents, If there were a series of bad joints, the current would not travel by the pipe at all.

Sir *W. H. Preece*, examined by Mr. LEWIS COWARD, said he had for the last forty years devoted considerable attention to electrical disturbances in the earth—first, in connection with telegraphs and submarine cables; then with railway signals, lightning protectors, and telephones; and more recently with magnetic observatories, and with water and gas pipes. There were always electric currents flowing through the crust of the earth. Sometimes they acquired great magnitude—especially when the sun's disc was affected by spots, and also when atmospheric electricity was excited. At certain periods when we had the aurora borealis, the crust of the earth was filled with electricity, which affected all telephone wires when they used the earth. He had known the whole telegraphic service of the country broken down by occurrences of this character. These currents entered into, and flowed through, complete metallic conductors which were in contact with the ground; metal pipes conducting so much better than the earth. Cables were damaged, and the ground connection of lightning-rods destroyed. Railway signals had been reversed, and magnetic records rendered useless. He had also known iron and lead pipes to be seriously corroded. It was very easy to tell how far these effects were due to natural earth currents, atmospheric currents, induction, or contact with or leakage from industrial mains. He gave evidence before Lord Cross's Committees in 1893 and 1896. [The resolutions arrived at by the Committees were here quoted by witness in some detail.] These Committees had come to the conclusion that electrolysis was due to faulty construction which they thought could be reduced to a minimum by improvement in this direction. They had said that the Board of Trade should make regulations to secure the best system of working electric tramways; and in pursuance of this expression of opinion, the Board of Trade had, after a conference with representatives of the Water, Gas, and Tramway Companies, and of all parties interested in electric enterprise, made regulations, dated March, 1894. Parliament had made the Board of Trade responsible for the safety of life and property, and given them power and discretion to frame rules and regulations of an elastic character. These rules and regulations had entirely fulfilled their purpose, and were complied with by all electric industries. The Board of Trade regulations admitted the adventitious use of the earth in the distribution of electric energy; but they mitigated any injurious action due to such use so as to make it practically negligible. His opinion had always been that it was nearly useless for the Board of Trade to make regulations unless they saw they were carried out. At the present moment, they were not carried out. Official tests should be made all over the country periodically. He had discussed the matter with the late Sir Courtenay Boyle; and that gentleman had objected to his proposal on the ground that it would add very much to the number of the Board of Trade staff. But witness felt that, in the present state of the tramways of the country, one additional inspector, with another appointed in the course of a few years, would be all that would be required, and would enable the Board to see that their regulations were properly carried out.

Mr. COWARD: In regulation No. 6 of the Board of Trade, it is provided that "the owner of any such pipe may require the company to permit him, at reasonable times and intervals, to ascertain by tests that the conditions specified are complied with as regards his pipe?"

*Witness:* Yes. The object of the tests under the Board of Trade regulations is to give Water and Gas Companies the simplest possible means of testing for themselves whether or not the regulations are carried out.

There is no difficulty in getting returns?—None whatever.

No one, I suppose, can claim a monopoly of the earth?—No. The telegraphs have always used the earth; and the electric light and tramway undertakers are allowed to do so under the Board of Trade regulations. Anyone can, and does, use the earth if he pleases. All injurious disturbances arising from this use of the earth are remediable; but the absolute remedies are too costly, and might check progress and enterprise. It is purely a question of £ *s. d.* The evil can be cured; but the question is, Can it be cured at such expense as to justify the steps requisite?

Mr. COWARD: What are the Board of Trade regulations as to uninsulated returns?

Witness put in the Board of Trade regulations, of which paragraphs 5, 6, and 7 were read. They are as follows:—

5. When any part of a return is uninsulated, it shall be connected with the negative terminal of the generator; and in such case the negative terminal of the generator shall also be directly connected, through the current-indicator hereafter mentioned, to two separate earth connections, which shall be placed not less than 20 yards apart.

Provided that, in place of such two earth connections, the company may make one connection to a main for water supply of not less than 3 inches internal diameter, with the consent of the owner thereof and of the person supplying the water, and provided that where, from the nature of the soil or for other reasons, the company can show to the satisfaction of an inspecting officer of the Board of Trade that the earth connections herein specified cannot be constructed and maintained without undue expense, the provisions of this regulation shall not apply.

The earth connections referred to in this regulation shall be constructed, laid, and maintained so as to secure electrical contact with the general mass of earth, and so that an electro-motive force, not exceeding 4 volts, shall suffice to produce a current of at least 2 amperes from one earth connection to the other, through the earth; and a test shall be made at least once in every month to ascertain whether this requirement is complied with.

No portion of either earth connection shall be placed within 6 feet of any pipe, except a main for water supply of not less than 3 inches internal diameter, which is metallically connected to the earth connections with the consents hereinbefore specified.

6. When the return is partly or entirely uninsulated, the company shall, in the construction and maintenance of the tramway, (*a*) so separate the uninsulated return from the general mass of earth, and from any pipe in the vicinity, (*b*) so connect together the several lengths of the rails, (*c*) adopt such means for reducing the difference produced by the current between the potential of the uninsulated return at any one point and the potential of the uninsulated return at any other point, and (*d*) so maintain the efficiency of the earth connections specified in the preceding regulations, as to fulfil the following conditions:—

(i.) That the current passing from the earth connections through the indicator to the generator shall not at any time exceed either 2 amperes per mile of single tramway line, or 5 per cent. of the total current output of the station.

(ii.) That if at any time, and at any place, a test be made by connecting a galvanometer or other current-indicator to the uninsulated return and to any pipe in the vicinity, it shall always be possible to reverse the direction of any current indicated by interposing a battery of 3 Leclanché cells, connected in series, if the direction of the current is from the return to the pipe, or by interposing 1 Leclanché cell if the direction of the current is from the pipe to the return.

In order to provide a continuous indication that the condition (i.) is complied with, the company shall place, in a conspicuous position, a suitable, properly connected, and correctly marked current indicator, and shall keep it connected during the whole time that the line is charged.

The owner of any such pipe may require the company to permit him, at reasonable times and intervals, to ascertain, by test, that the conditions specified in (ii.) are complied with as regards his pipe.

7. When the return is partly or entirely uninsulated, a continuous record shall be kept by the company of the difference of potential during the working of the tramway between the points of the uninsulated return furthest from, and nearest to, the generating station. If at any time such difference of potential exceeds the limit of 7 volts, the company shall take immediate steps to reduce it below that limit.

Mr. COWARD: It is plain from the regulations that not only the undertakers themselves, but the complainants, can ascertain whether or not they are being complied with?

*Witness:* That is so. I might add that they are not fixed rules and regulations. They are elastic, and are subject to reversal or alteration at any time by the Board of Trade, who are always ready to listen to representations as to defects in their system. The Board of Trade regulations indicate the existence of disturbances, and define the mode for their removal. Even admitting that in a few exceptional cases the existing regulations of the Board may not give absolute security, the proper course would be to lay the special circumstances of the case before the Board of Trade, with a view to obtaining a suitable modification of the regulations. The electrical corrosion of pipes depends simply upon the direction in which the currents flow. If they flow into the pipes, there can be no corrosion; but if they flow out, there will be corrosion.

What are the remedies for this state of things?—There are several remedies. The first is rather a drastic one. It is to get all the pipe systems into one conducting mass—remove all bad joints from the gas and water pipes. Of course, with thousands of miles of pipes laid down, it is quite out of the question to do this with the old ones; but in all new undertakings it should be done. I think the gas and water interests see the advantage and necessity of making perfect joints; and the bulk of them now are using lead, which makes a perfect joint. I know it is a perfect joint in a water system. The tests we have made at the Post Office show there is no fall of potential when that was done. The second remedy is to connect the conducting mass to the negative pole at the power-house. The third is that adopted by the Board of Trade—the reduction of the potential difference between the terminals of the "uninsulated return" to the lowest limit. The Board of Trade allow 7 volts; but in practice it is much less than this. The 7 volts might be made 5 volts. The former figure was adopted at the suggestion of one of the representatives of the Water Companies. No company have ever found the smallest difficulty in meeting this regulation. The drop of potential, as a rule, is very much less than 7 volts. The fall of the potential is the matter to be decided. The fourth remedy is a proper control of the direction of the current. If we find that the current is leaving the water-pipe, it is not difficult to reverse

it, or change its direction. This can be done by what was referred to by the last witness—a negative booster or a positive booster. Then we have the use of insulated returns; and there is another certain cure for all these troubles—the use of alternating currents. But with our present experience, the use of these currents for tramways is out of the question; it is impracticable. Lastly, the whole principle which underlies the maintenance of all these things, so far as the evils and dangers are concerned, is prevention rather than cure—periodical testing and recording. You do not want to wait till the pipes are corroded to remove the cause of the corrosion.

In reply to further questions, witness said that, in his opinion, the existing regulations of the Board of Trade, if complied with, were amply sufficient to protect the gas and water pipes from corrosion.

Mr. BAGGALLAY (in cross-examination): You are not satisfied with the Board of Trade regulations?

*Witness:* Yes; I am.

Then why do you have two pages (section 44) in the Act of 1898 for the special protection of the Postmaster General? Is that unnecessary?—Certainly not.

The telegraphs and telephones of the Post Office require protection outside the Board of Trade regulations?—They do.

Mr. BALFOUR BROWNE: But that is not in reference to electrolysis.

Mr. BAGGALLAY: It is for protection from stray currents of working electrical undertakings.

Mr. BALFOUR BROWNE: But not protection from electrolysis.

Mr. BAGGALLAY: We will deal with that when you have finished your case. (To witness:) You have given us a number of remedies.

*Witness:* Yes.

For what?—To mitigate the effects of electrolysis on water or gas pipes.

Then you think there are further remedies necessary?—I said so. I said the whole of the regulations of the Board of Trade were to mitigate the evils.

Is it a fact that there is at present an evil that has not been sufficiently coped with?—No. I have said that the Board of Trade regulations are quite sufficient. I have given a list of possible remedies; but I have pointed out why some of them are impracticable.

If you could bond the old joints in the pipes, you would recommend that to be done?—Yes. In new works it should be done.

In 1898 you stated that there was one difficulty which up to that time had not been entirely removed, and that was in connection with "the working of tramways by trolley wires, as they were called." You said: "There are these currents running about wildly, affecting water-pipes and gas-pipes;" and you went on to say that they had, in three or four instances, affected very seriously the lead covered cables which you were using now in England for telegraphic and telephonic purposes. You said that the remedy for this had not yet been applied, and that gas explosions had occurred through these stray currents?—Yes.

That was four years after the Board of Trade regulations had been made?—Yes.

And notwithstanding that evidence of yours, no alteration has been made in the regulations?—No. My point is that the Board of Trade regulations were not fully carried out, and that the Board of Trade should see that they were carried out.

You say they are not sufficient for the trolley wire system?—Well, I can answer the question better now than I could then. In the last part of my answer about lead covering, I had a Clapham Junction case in my mind. There we had several currents escaping and passing through the pipes. Owing to lightning or some other cause, a spark fired an accumulation of gas.

Unless you have insulated returns, there is an uncertain quantity of electric current escaping; and it is exceedingly difficult, under the existing regulations, to know what damage is being done?—I have stated distinctly that it is under control.

Mr. BAGGALLAY: Then why do you want these two pages of regulations for the Post Office?

*Witness* was understood to say that the regulations were adhered to because they were in the old form. It was true that the Post Office insisted upon them in all Bills. Special precautions were taken in the laying of leaden pipes. The joints were leaded and did not require bonding.

Mr. BAGGALLAY: You are careful to do that which the Water and Gas Companies cannot do with their pipes?

*Witness:* We do what we want the Water and Gas Companies to do in the future.

Mr. BAGGALLAY: Who ought to look after a wild beast—the person who owns it, or the person who may be bitten by it?

Mr. BALFOUR BROWNE (interrupting): That is a legal matter.

Mr. BAGGALLAY: No; it is *apropos* of the witness's last answer, to the effect that the Water and Gas Companies should protect themselves.

*Witness:* But electricity is not a wild beast. It is as gentle a creature as there is, and is under complete control.

Mr. BAGGALLAY: Sir Courtenay Boyle said that the Board of Trade regulations could be amended.

Mr. BALFOUR BROWNE: And he added that they had been.

Mr. BAGGALLAY (to witness): Sir Courtenay Boyle said that Water and Gas Companies were innocent users of the road, and could not protect themselves. Do you agree with that?

*Witness:* They are innocent users; but they can protect themselves.

That is so with regard to new pipes that they may lay down now, but not as to their old pipes?—Practically, the trouble exists, not with water, but with gas pipes.

In further cross-examination, witness said that they could not tell whether electrolysis was taking place without uncovering the pipes; and they could not always tell when they were uncovered. In the case of water pipes, formerly the jointing was done very imperfectly; and an electric current reaching the main would go along the metal or through the water. If it went through the water, he could not see where the corrosion would come in. But the whole thing had been grossly exaggerated. The Board of Trade regulations admitted a loss of 2 amperes per mile of tramway; but if it were double that—4 amperes per mile—it would take 10,000 years to destroy the water and gas mains.

Mr. BAGGALLAY: But you have said in evidence, on a previous occasion, that the pipes have been corroded, and that there has been an escape from them?

*Witness:* That has been from fusion—from absolute sparking. To my mind, the Board of Trade require strengthening in their inspecting department, to see their regulations properly carried out.

Re-examined by Mr. BALFOUR BROWNE, witness said that section 44 of the Act of 1898, which was for the protection of the Post Office, had nothing to do with electrolysis. It had to do with induction and leakage, which would disturb telegraphing and telephoning, but which was not calculated to eat away pipes.

Mr. BALFOUR BROWNE: As a practical man, do you think that the Board of Trade are sufficient for the protection of these Companies?

*Witness:* I do.

Do you know of a single case of damage to a water-pipe through electrolysis?—No. I have to gas-pipes; but that has been owing to abnormal circumstances.

The CHAIRMAN: What occurs to me is this: It is admitted that there is some danger to the mains from the action of the electric current; but how much is entirely speculative. We may have evidence that damage will not be done in 10,000 years, or that it may be done at any moment. It seems to me that in this way the inquiry might go on *ad infinitum*. Is not it the fact that you want these regulations strengthened? I do not know whether pipes that have been corroded are to be produced.

Mr. BAGGALLAY: Yes; we are going to produce some.

The CHAIRMAN: I think we have it clearly before us how danger may possibly arise.

Mr. BALFOUR BROWNE: If the Water Companies can prove it to you, they would have proved it to the Board of Trade.

The CHAIRMAN: The only question is whether the Board of Trade regulations require strengthening.

Mr. HELME: It would save the time of the Committee if Counsel would confine themselves to addressing such arguments to us as will compel us to grant powers which cannot be obtained under the present Board of Trade regulations.

Mr. PEMBER said he was asking for more than the Board of Trade regulations. He maintained, not only that it did not require 10,000 years to effect electrolysis under the Board of Trade regulations, but that it had already been brought about.

The CHAIRMAN: Yes; we have it before us that damage is done from time to time. Is it worth while going further into the matter?

Mr. PEMBER said that, for the petitioners, he would not call lengthened scientific evidence. The ground was cleared to a large extent, for Professor Thompson admitted that damage occurred whenever the current temporarily escaped from the metals.

Mr. BALFOUR BROWNE: He does not admit that it takes place where the difference of potential is under 7 volts.

The CHAIRMAN: How many more witnesses have you?

Mr. BALFOUR BROWNE: We have not many.

The CHAIRMAN: We want some practical evidence. We will not go further into the scientific matters.

Mr. BALFOUR BROWNE: Yes—practical. That will exclude my learned friends.

Mr. *H. F. Parshall* said in none of the installations with which he was connected, nor in any other with which he was acquainted in this country, working under the Board of Trade regulations, had there been any indication of electrolysis. Electrolysis would be as dangerous to the different tramway companies working by electricity as to the gas or water companies, since the cables for working the tramways were laid parallel and near to the rails, were uninsulated from the earth, and had metallic sheathing comparable with gas and water pipes in electrical conductivity. In both the St. George's Power Station, Bristol, and the Dublin-Dalkey installations, which had now been at work for a number of years, lead sheathed high-tension armoured cables were laid parallel to the track and near the rails, and were there a difference of potential between the cables and the track sufficient to produce electrolysis, the iron armouring and the lead sheathing would have been eaten away, and the cables rendered useless. When the lead sheathing of a cable was punctured, it was only a matter of a few hours before the insulation of the cable failed, and the cable became useless. The cable sheathing in both of the cases referred to had been examined from time to time, and there had been no evidence whatever of electrolysis or corrosion in any form. The same applied to the rails and bonds; since, if the current left the rails at sufficient potential to produce electrolysis, the rails and bonds of the company would deteriorate, Such deterioration had not occurred. In Bristol three separate investigations had been made by the Water Company, two of them by Dr. Fleming; and he had been unable to find any trace of electrolysis. The water-mains entering the powers station would be particularly subject to electrolysis, since the current would naturally gather round the pipes in the vicinity of the station. He had examined such pipes, and had found no evidence of electrolysis. The results clearly indicated that the earth acted as a conductor of current, and not as an electrolyte. The distinction in practice amounted to this: That current flowing through conductors did not produce electrolysis. For the production of electrolysis, it was necessary for a current to flow from one conductor to another, through a suitable electrolytic solution. It would be unfair to subject the undertaking by a special clause entitling the existing companies to the right of litigation, since the company were already burdened with a large capital expenditure in order to comply with the Board of Trade regulations, and give that amount of protection required by the Board of Trade which had clearly been proved to be ample. The additional cost as regarded sub-stations, track feeders, and boosters to comply with the Board of Trade regulations throughout the London United System would be not less than £50,000, which sum, if placed at interest, would be more than sufficient to provide against any litigation or damage which could be proved as having been caused by electrolysis were the installation worked in the ordinary way. A certain amount of corrosion of pipes took place at all times; and in litigation, which had heretofore occurred, where the installation had been put down without any rules or regulations, it had been found extremely difficult to separate natural corrosion from electrolytic action.

The CHAIRMAN asked for what purpose the cables were used.

*Witness* said they were to carry the electricity from the power-station to remote parts.

Cross-examined by Mr. PEMBER, witness said that no doubt if no one had any interest in the matter but the Tramway Company themselves, they would have a much freer hand. He thought that when they had complied with the Board of Trade regulations they had done enough to make other people safe.

Mr. PEMBER: You are the aggressors in this matter. The Water Companies were there first; and all their pipes are quite passive and innocent?

*Witness:* We are as innocent of injury to them as they are to us. I do not say that electrolysis cannot take place under any conditions; but I say that under no circumstances where lines are worked under Board of Trade regulations can it occur.

Have you heard of the Liverpool instance?—I have heard of it; but if they are killing people there, I do not see how they can be working according to the Board of Trade regulations. No doubt the lines are operated by responsible people—the Corporation.

In further cross-examination, witness said that the Corporation were the water as well as the highway authority; and they would hesitate to ruin property which had cost them an enormous sum, if there was danger under the Board of Trade regulations. In Dublin, they had return feeders to pick up 90 per cent. of the return electricity. About 20 per cent. came back in the lead sheathing of the cables. The rails had been laid about seven years in those parts of Bristol where electrolysis was most likely to occur.

Mr. *J. R. Salter* said that during the time he had been connected with the London United Tramways he had given special attention to the subject of leakage currents from electric tramways, owing to the proximity of the Kew Observatory. During the reconstruction of the Bristol system, he had frequently examined the gas and water pipes which had been laid open; but in no case had he been able to see any sign of damage or corrosion which could be attributed to electrolysis, nor had he ever heard of a pipe being injuriously affected by any leakage currents from a tramway working under Board of Trade regulations. With regard to making the tests required under the regulations, this was a very easy thing, because all one had to do was to join a testing instrument to the rail, and form a connection by means of the hand with a lamp-post or stand-pipe, or anything of that sort that was near.

Mr. PEMBER: You would not be able to tell if there was current in the pipe.

*Witness* replied that a good indication would be obtained if there was the least current. He had seen tests applied to open pipes in London in a district where the tramway was run by horses; and he had observed from 2 to 5 amperes of electricity in them. This was a natural earth current. He had heard of the Clapham Road experiment; but this was in connection with a railway, which, of course, ran under different conditions from tramways. It would therefore seem that, in any conducting system laid in the earth, there must necessarily be considerable earth currents; and it would appear that the Water Companies have as much to fear from electrolytic damage from these earth currents as they have from a well-designed electric tramway working under Board of Trade regulations.

Mr. *Stephen Sellon* stated emphatically that no case of electrolytic action in gas or water pipes had been brought to his knowledge on the systems for which he was responsible. He thought that any clause similar to that inserted in the Sheffield Bill would have a serious effect on the tramway enterprise of the country. As a man of experience, he did not think that anything more was required than the Board of Trade regulations. In the Swansea case, the Company, when they arrived at the inquiry, found that the Corporation had given the Gas and Water Companies protection similar to that now asked for. The Company objected to it; and the Light Railway Commissioners struck it out, after hearing arguments on both sides—leaving the Company subject merely to the Board of Trade regulations. The Light Railway Commissioners had either refused to give this clause when it was asked for, or struck it out when it had been put into a scheme.

In cross-examination by Mr. PEMBER, witness said that, in the case of the Finchley Tramway, the Sheffield clause had been accepted; but he imagined that the present promoters intended to clear out, and leave the result to be faced by other people.

Mr. PEMBER said that, if witness's contention was right, that the tramways would do no harm to the gas and water pipes, why should they object to being made responsible for any damage?

In reply, witness said there were certain things which would occur to gas and water pipes beyond those which were brought about by electrolytic action.

Mr. PEMBER: But the *onus probandi* would lie upon us?

*Witness:* No doubt; but there would be serious litigation. The object of a company is to pay dividends to their shareholders, and not to spend their money on lawyers.

But does not that also apply to water companies?—They have a great deal more money than we have. Then, again, there are many small companies with a capital of £20,000 or £30,000; and, in their case, litigation would mean ruin. If the clauses were inserted here, this case would become a precedent.

If you do damage, should you not pay for it?—Not if we comply with the Board of Trade regulations. If you will relieve us of the Board of Trade regulations, we will agree to your terms; but I say they are an absolute safeguard.

In re-examination, witness said when a statutory company got an Act of Parliament, it was always relieved from the payment of compensation, unless negligence was proved against it. To adopt the proposal of the petitioners now would be to alter the statutory law of the country. It would not be possible to say that an electric current which caused electrolysis was a current which came from the tramway or from some other source.

Mr. BALFOUR BROWNE said that that concluded the case for the Tramway Company.

(*To be continued.*)

# LEGAL INTELLIGENCE.

## HIGH COURT OF JUSTICE, IRELAND—KING'S BENCH DIVISION.

**Monday, June 24.**

(*Before Justices* MADDEN, BOYD, *and* BARTON.)

### Dublin Corporation v. South Dublin Guardians—The Supply of Water to a Workhouse.

A motion came before the Court to-day in the matter of an application by the defendants for a new trial of an action brought by the Corporation against the South Dublin Guardians in respect of the water supply to the Union in James's Street during the past three or four years. The Corporation had claimed an injunction to restrain the Guardians from continuing to take Vartry water by a supply-pipe more than ½ inch in diameter, and for damages for water taken, as water taken tortiously. The case was tried before the Lord Chief Baron, when he directed the Jury that they should find for the plaintiffs, assessed the damages at £1340, and granted the injunction prayed for. He stayed judgment so as to enable the defendants to appeal. For many years the Guardians had been supplied with water by the Corporation under a contract at so much per 1000 gallons, on the assumption that their concern was an institution, and not entitled to be supplied as a dwelling-house on the ordinary terms of a domestic water-rate in proportion to the valuation. [In England, in the case of *Liskeard Union v. Liskeard Water-Works Company*, it has been held that, for the purpose of water supply, a workhouse is to be treated as a dwelling-house.] The Guardians were then advised that their contract with the Corporation was *ultra vires*, and rendered them liable to surcharge, for all extra money paid under it. They then dispensed with the contract, and required the Corporation to continue the supply on the ordinary terms of a domestic water-rate, which the Corporation refused to do. The Guardians were required to disconnect, and were eventually sued. The arguments on the new trial motion were renewed recently on a fresh aspect of the case, apparently presentable under the Corporation Act, 1890, section 46, which prohibits any citizen from laying any pipe or interfering with the streets.

At the close of the arguments of Counsel,

Justice MADDEN held that, notwithstanding the legislation of 1890, the supply-pipes of all private consumers in Dublin must be held to be pipes laid by the inhabitants as well as pipes laid at their own expense, within the meaning of the Acts of 1847 and 1861; and, therefore, the pipe in this case, the existing 6-inch pipe, was one for which the Guardians were responsible, and he upheld the decision of the Lord Chief Baron.

Justice BARTON concurred.

Justice BOYD dissented, and said, reviewing the statutes on which he founded his judgment, that section 50 of the Act of 1847 had no application to this pipe in Dublin; and he thought that the decision of the Lord Chief Baron was erroneous.

On the application of Counsel for the Guardians, the Court granted a stay of judgment for one month, to enable the defendants to be advised, and, if necessary, take the case further.

### Heavy Penalty for the Wrongful Use of Water.

At the Southampton County Bench last Friday, Edwin Charles Andrews was summoned, under the Water-Works Clauses Act, for allowing water supplied to him by the South Hants Water Company to be used by another person, and also for using water supplied to him by the Company for other than domestic purposes. Andrews pleaded guilty. From a statement by Mr. Wharton, representing the Company, it appeared that defendant was the owner of a cottage at Bitterne, and his father the proprietor of an adjoining market garden. William Bishop, an inspector for the South Hants Water-Works Company, while going his rounds, saw defendant using the Company's water with a hose attached to the water-pipe. Defendant stated that the pumps broke down on the occasion of the visit of the inspector, and he did not think there was any harm in using a little water from the tap while the pump was being repaired. Admiral Rowley, who presided, said the penalty for the first offence was £5, and £2 for the second. Defendant would have to pay a penalty of £4 for the first offence, and £1 for the second, with 7s. costs in each case—£5 14s. in all. Mr. Wharton said he would withdraw the summons against the father on payment of costs. The Bench allowed the informations to be withdrawn; but Admiral Rowley expressed the opinion that it looked like connivance on the part of father and son to defraud the Company.

**Extension of the Halifax Corporation Gas Supply.**—A Provisional Order authorizing the Halifax Corporation to purchase from the Sowerby Bridge District Council their gas rights in Warley and Skircoat has passed the House of Commons. Its promotion arose through the inclusion of Warley and Skircoat within the borough of Halifax. These places are in the gas area of Sowerby Bridge, as defined by the Sowerby Bridge Gas Act of 1861. When the two districts mentioned were added to Halifax, it was obvious that, from the point of view of public convenience, there should be only one gas-supplying authority for the borough. The Corporation approached the District Council, and, by a perfectly friendly agreement, it was decided that Halifax should purchase from Sowerby Bridge the whole of their gas undertaking in Skircoat and Warley for £9181. A Local Government Board inquiry was held, and upon the Inspector's report the Order was issued. There is a clause which directs that the amount paid by Halifax shall be applied either to works or objects on which capital may properly be expended when the Local Government Board have sanctioned the application of the sum for this purpose, or towards the reduction of such part of the money borrowed by the Council for the purposes of their gas undertaking in such manner and under such conditions as shall be determined by the Local Government Board.

# MISCELLANEOUS NEWS.

## THE WELSBACH COMPANY'S MEETING.

Nearly half-an-hour before the time fixed for the meeting of the Welsbach Company last Thursday, practically the whole of the seats in the Grand Hall of the Cannon Street Hotel were occupied; and by noon, when Sir Henry C. Burdett, K.C.B., stepped into the chair, accompanied by his few faithful colleagues and principal officials, there was a substantial fringe of standing shareholders round the room. Some of the erstwhile Directors and the retiring Managing-Director (Mr. H. L. Peters) had put in an early appearance, and secured seats together in a prominent position in the hall. When it came to the voting later on, it was seen that the opponents of the remnant Board were seated in a little knot in close proximity to the retired Directors; and when they held up their hands against the adoption of the report they made a miserable showing compared with the solid vote which Sir Henry Burdett and his colleagues received.

The uncertain temper of the meeting was soon disclosed. When Sir Henry (in whose integrity and straightforwardness the shareholders generally have implicit trust) first appeared on the platform, he was greeted with an encouraging heartiness; but a few minutes later when the Secretary (Mr. W. Resbury Few) was performing the simple duty of reading the notice convening the meeting, he was bid from different parts of the room, in tones more forcible than polite, to speak up. However, when the Chairman obtained the ear of the shareholders a few minutes later he soon steered things into a course which brought the meeting to an end in perhaps the most advantageous manner to all concerned. His speech was frank and statesman-like; and no one who heard it could fail to detect about it the ring of sincerity.

### The Results of the Trading.

Touching upon the report a little in detail, Sir Henry said that the gross profit on the trading of the year was £122,792, as against £159,029 in the preceding year. The net profit was £62,254. The dividend received on the Austrian shares was £65,451. After deducting salaries and other charges relating to the Austrian business, a net sum of £62,582 was left from this source. There was thus a net loss on the English business for the year of £327. Two items had seriously affected the amount of profit of the English business: (1) The special allowance for the trade on the stocks acquired before, and the expenses due to, the reduction in prices £10,817; and (2) the further depreciation of materials in stock £5785. The latter was comparable with a charge of £5470 under this head for the previous year. Passing on to the expenses charged against profit and loss for the year (£99,294), he pointed out that the charges under this head amounted to £101,728, or a decrease of £2434—a sum too small to make any appreciable difference in the net result of the trading. The volume of business had continued to increase since the Company's formation. The sale of mantles during the year—8 millions, exceeding any previous annual output—represented an increase of 46 per cent.; and the sale of burners (nearly 1 million) showed an increase of about 75 per cent. The balance to the credit of profit and loss account, in round figures, was £66,000—a sum out of which the Board would have been glad to pay a dividend on the preference shares had the money not been required for the purpose of the business, owing to the imperative necessity which existed for the erection of new factories for the more economical conduct of the business. Mr. Peters had explained to the Board that the gross profit for last year had been reduced by the further special item of £6250—the extra cost of fluid in excess of anticipation when the reduction in the price of mantles was decided upon.

### The Secessions from the Board.

Passing to the question of the secessions from the Board, the Chairman did not by any means mince matters. Regarding the statements that there had been squabbling at the meetings of the Directors, he said this was incorrect. The old Board practically from first to last was never divided in their policy; and all that had happened since was that the introduction of the promoters on the Board, and especially Mr. Samson's presence, had created a state of affairs which could be best described as the introduction of an "Irish Party," which, in the person of Mr. Samson, had obstructed business, had endeavoured continuously to prevent the setting up of new sources of revenue, had taken little or no interest in the Company's business (of which Mr. Samson had more than once declared himself to be entirely ignorant), and had occupied hours and hours of time in labouring legal points which were no business of the Board's and ought to have been left to the Company's Solicitors. The reason for the sudden retirement of the Managing-Director was unknown to anyone officially connected with the Company until the previous morning, when a letter was received from him, from which the following is an extract: "Although the Directors have made no inquiry of me as to the reasons that led me to resign, I desire to state, in order to avoid misapprehension or false impression which might otherwise arise, that my resignation was in no way connected with the results of the year's trading. It was due to the fact that I had lost that feeling of confidence in the majority of the Board which was to me absolutely essential, and without which I feel I could not do justice either to the shareholders or myself." With evident compunction, the Chairman referred to a private conversation with Mr. Peters at the close of a Board meeting on the Thursday preceding the issue of the report. Mr. Peters then said that he could not resign in the state of the Company's affairs at this time; and he (the Chairman) agreed with him, because he held very strongly that there were responsibilities attaching to those who represented shareholders' interests in undertakings of this character which no man, being a man, could avoid by resignation. Then the Chairman entered into the circumstances connected with a special resolution of Mr. Peters, proposing the cancellation of an agreement, which was to be considered at a meeting of the Board on the following Friday. He (the Chairman) could not consent to its entire cancellation—the Solicitors advised that it was legally non-effective—and he informed Mr. Peters that if he could bring up some resolution worded so as to dispose of the agreement short of its cancellation, it should have his support. He left him with the impression that he would do this. When he arrived in the Board-room on the Friday morning, without any notice or intimation of any kind, a letter was handed to him containing Mr. Peters' resignation. A second letter intimated to the Board that, until the appointment of his successor, Mr. Peters would facilitate as much as possible the carrying on of the business. That was the story; and the Chairman left what was evidently a distasteful subject to him with the remark: "I appreciate Mr. Peters' good points as much as any man can." Proceeding, the Chairman said that though every member of the original Board, and every member who had joined since with one exception, was an entire stranger to him, he had always been supported by a majority of the Board from the day of the incorporation of the Company up to the present time, even in the past year, when five of the members of the Board were nominees of the promoters and brokers. He thought this fact should satisfy the shareholders that the theory of the incapacity of the Chairman might be regarded as humbug. This was the point which made this meeting so serious, and might even make it epoch-making in the history of company law. It had been maintained and circulated throughout the City and the country, he understood vigorously, by the promoters for the last eighteen months. For the sake of the shareholders, and for his own sake, he had disregarded these libelling attacks. He did not propose to refer to it more that day; but he could well understand the shareholders were aware that all this business—the pecuniary injury the Company were suffering—had issued from the one origin, the promoters. "I am happy to tell you," said the Chairman impressively, "that we are to-day free from the influence of the promoters on the Board. That influence as I know to my cost has been the bane of the Welsbach Company from the outset." A ringing cheer followed these remarks.

### The Policy of the Board and the Price of Mantles.

With an invitation to shareholders who desired to go into the differences which have arisen to meet him by appointment at the Company's offices where he has all the documentary evidence, the Chairman passed on to speak of the policy of the Board. When the Company came under his chairmanship, the list price of the mantles was 1s. 3d. On June 1, 1898, the price was reduced to 1s., without material injury to the net revenue. In March, 1899, the question of a further reduction in price was considered by the Board, and resisted by the Chairman and a majority of the Directors on the grounds of inexpediency, the difficulty of making up the loss of income, and because the law officers of the Company advised that a decision would be obtained in regard to the 1893 patent by the following December—that was, prior to the expiration of the master patent at the commencement of the following year. Now although the 1893 patent had been certified, "*no decision*," remarked the Chairman, "*has yet been obtained in the Law Courts*," owing to the difficulty of getting anyone to contest it there. It was well, he said, to state in this connection that up to the time of the promoters joining the Board, a dividend was earned and paid, not only on the preference stock but on the ordinary stock as well. The new Managing-Director commenced his duties on Jan. 1, 1900; and since then no dividend had been paid on the ordinary stock, and no dividend had been declared on the preference stock since the application of the new policy of reduced prices. The Managing Director and Messrs. Samson and Harris each advocated a still more sweeping reduction than from 1s. to 7½d. Under the conditions on which Mr. Peters took office—viz., as the nominee of the representatives of a preponderating amount of stock—the majority of the Board felt it necessary to allow him the freest possible hand in framing the policy and in conducting the business of the Company. Had a reduction to 6d. been made, there might have been a loss on the English business of the Company for the year ending March 31 of quite £32,000; seeing that on a turnover of 8 million mantles per year, a reduction of 1½d. more would have represented £50,000 gross. The Managing Director appeared to have failed to recognize that in a business like this, with a turnover of between £350,000 and £400,000 a year, it was not possible, in the limited period of twelve months, to so increase the bulk of the business as to enable the Company to recoup themselves the loss entailed by a reduction of 4½d. per mantle, representing £150,000 gross on the number sold. This large reduction was carried at a Board meeting on April 18 when the Chairman was absent abroad, and was confirmed as a policy later when the Chairman was present, though some of the majority protested against it. It was therefore clear that the policy which had produced the present position with regard to profit and loss on the English business, and which he (the Chairman) regarded as temporary, was imposed on the Board by the promoters who claimed to represent some 2 millions of stock. The mistake made was not in reducing the price of the mantles, but in too large a reduction in price at one time.

### The Future.

As to the future, if the shareholders would have a little patience, and would allow their affairs to be administered by the present Board, by the men who had stood by the ship throughout, although often tempted to leave it—they would, the Chairman held, have the best guarantee they could obtain for future prosperity. After this hopeful remark, the Chairman dealt with the frequent suggestion that the capital should be reduced by an amount represented by available assets; and the question, he assured the shareholders, had had very careful consideration. He gave a lucid explanation of the difficulties which stood in the way, and an assurance that the matter should not be lost sight of. He then swept on one side a little misapprehension as to his own commercial knowledge, by stating that the first ten years of his business life was spent in Birmingham, where he had, under exceptionally advantageous circumstances, acquired a sound knowledge of business. As the result of his knowledge of the Welsbach Company, he was of opinion that, in addition to a commercial manager of wide business experience, who should have the entire control of the purchase of the raw materials and the distribution of the finished article, they should have a factory superintendent in charge of the mantle making. The English business was progressive; and good economical administration, accompanied by a cheap and adequate system of distribution, combined with the special cultivation of new sources of revenue, should make the

Company's business profitable. A word of congratulation to Baron Auer von Welsbach upon the high honour conferred upon him by the Emperor of Austria led to some remarks as to the osmium electric lamp, from which it appeared that the sale of half patents for Germany and half patents for France placed about £100,000 to the credit of the osmium lamp in the Austrian Company; and already Baron Auer had repaid the amount of money advanced by the Welsbach Company, with 4 per cent. interest. The Chairman was informed that the lamp had been brought to an excellent state, but they were now waiting for a supply of osmium, for which diligent search was being made. In his concluding observations, the Chairman said he had always been glad to meet the shareholders, but never more glad than that day, because he was at last free to speak what he really thought.

### Further Condemnation of Late Directors.

The motion was seconded by Mr. James Head, who was elected a Director a year ago. It was represented to him that the Chairman was unbusiness-like; but he stated that he had not found him so. On the contrary, he found that he was being bullied and insulted; and his attitude through those trying times deserved the highest praise. There was no hesitation in the words Mr. Head used in condemning the conduct of the late members of the Board; and he mentioned that the Board were now quite harmonious, excepting Mr. Bethell. He could not congratulate Mr. Peters on the moment he chose for his resignation; and he considered it was a grave error to have ever created the office of Managing-Director at all, believing it was done solely with the view of destroying the authority of the Chairman. He thought that five Directors would form a good working Board; and he claimed to have been largely instrumental in reducing it to this number, and purging it from the evil influence of the promoters. "It remains for you, gentlemen," he added, "to say whether you approve of that action, or prefer they should lead you once again in the downward path of ruin and reconstruction, which seems to be the object they had in view."

### An Advisory Committee.

Following this the Chairman referred to notices of amendments he had received, and which, so far as they formed direct negatives, Counsel advised, must be ruled out of order. Among the suggestions was one that a Committee of Investigation should be appointed; but Counsel again advised that the shareholders had no power to enforce on the Board such a Committee of which no notice had been given to the shareholders. In consequence of this decision, the Chairman stated that he had been approached on behalf of a large group of shareholders and by General Russell and the Hon. Philip Stanhope, asking the Board to consent to an Advisory Committee, to report on the management of the Company, and to employ such competent assistance as they might require. The Committee would consist of the following gentlemen (all of whom had consented to serve): Mr. T. J. Barratt, the Chairman of Pears, Limited; Mr. W. Whiteley, the Chairman of Whiteley, Limited; Mr. Edgar Williamson, the Chairman of Jays, Limited; Mr. G. A. Touch, the Chairman of the Trustees and Executors Corporation; General Russell; and the Hon. Philip Stanhope. The Board, the Chairman explained, had agreed that the adoption of the first resolution passing the report should be held to carry with it the appointment of this Committee. The Board entertained the hope that the recommendations of the Committee would be acceptable to them, in which case they would immediately be carried into effect, and a copy of the report be issued to the shareholders. In the event of the Board being unable to assent to the proposals of the Committee, they would call a special general meeting without delay. This was an excellent stroke on the part of the Chairman; and it was plain from the tokens of approval that his openness gained the sympathy of the shareholders, the bulk of whom, when occasion offered, did not refrain from giving vent, in an expressive manner, to their disapproval of the seceders.

### Mr. Peters Explains—The Price of Mantles Again.

An opportunity for explanation was then given to Mr. Peters, who was anxious the shareholders should understand that, finding himself opposed to the majority of the Board on matters quite outside the trading policy, but none the less important in their bearing on the destinies of the Company, his only course was to express his disapproval by the step he had taken. His determination, he stated, was the result of a combination of circumstances which he should be pleased to place before any Committee, but not (in the interests of the business) before a public meeting. Upon this statement there were derisive cries, and remarks of "Out with it" and "We ought to know what you have to say." "I have decided," said Mr. Peters, "that this is not the place to make an explanation." There was further hooting, and cries of "Sit down." The Chairman appealed for a fair hearing for Mr. Peters, and added that, so far as the Board were concerned, he hoped that Mr. Peters would not keep anything back for any Committee. This remark was greeted with cheers. Mr. Peters then proceeded to speak on the question of the policy of the Board during the past year, and particularly regarding the point as to the price of the mantles. On the contention that the reduction of price was a sweeping one, he made a point when he said that "others can sell at less than you." He maintained that the results in the magnitude of business done was entirely due to the change in price. But the time had been too short in which to reap the benefit, besides which the whole of the expenses contingent on the reduction had been borne during that short period. The expenses of the business, owing to the organization which had been built up on elaborate lines, were, in his judgment, far too high; but the time the business had been in his hands had been insufficient to effect large changes—such, for instance, as in the system of distribution, without risk to its efficiency, at a time critical in the Company's business. Important reductions had been made in the cost of raw materials; but he considered the English business had had to pay through the nose for its supply from the Austrian Company. Then the manufacturing facilities had been deficient; but this would not be the case when the new factories were built. There was something at once ominous and sensible about his remark: "I will not here dilate upon the weakness of the patent laws; but your prices are not the lowest. Unless you can rely upon a patent monopoly, you must place yourselves in a position of commercial supremacy." His suggestion was that the Company should go ahead; and it must lead them eventually to success, with a sound and firmly established business basis. These remarks were well placed; but Mr. Peters again irritated the shareholders into disapproval when he said in his concluding remarks: "There are gentlemen on that Board with whom I would not resume office." Why? was the natural inquiry. His reply was: "I have told you, gentlemen, enough already. I have lost confidence in the majority of the Board."

### The Promoters of the Advisory Committee.

General Russell was the next speaker; and he confessed that he had not yet heard a word which justified Mr. Peters' decision to resign. As to the large reduction in price, however, he regarded it as most indefensible and injudicious. No one, he asserted, would persuade him that the working expenses were not exorbitant; but what, he inquired, had the late Managing-Director been doing during the last year and a half? He spoke strongly against the movement for changing the present Board; and no less trenchant were his remarks about the promotion of the Company. The Hon. Philip Stanhope, who has £10,000 invested in the Company, explained the circumstances under which the proposal for an Advisory Committee came about. He made it clear that he would not take any part whatever on a Committee upon which the promoters had any nominee; and he threw in a remark (which was lustily applauded) that at the last general meeting two men were "juggled" on to the Board, representing the promoters, who ought never to have been there. It was stated, among other things, by Mr. A. Morton that he still entertains hope as to the future of the Company; and he thought the preference shareholders ought to have had a dividend out of the balance in hand.

### Mr. Samson Speaks.

A long speech was delivered in stentorian tones by Mr. Samson (one of the seceding Directors); and it was commenced amid contemptuous hissing. His first remarks were directed to show the care he exercised as a promoter in having every circumstance absolutely disclosed in the prospectus of the Company; and he referred to the steps Sir Henry Burdett took to obtain an independent investigation before he permitted his name to be attached to the prospectus. Then he told a story of some length as to how Dr. Welsbach had sold the controlling power which he possessed in the Austrian Company to the English Company, and had regained it without holding a single share. He alleged that the arrangement had been most hurtful to the latter Company. He defended the policy of popularizing the Company's goods by reducing the prices; and he expressed the belief that they were only on the threshold of incandescent gas lighting. He knew there was a large trade done by infringers—in fact Mr. Moeller had said that there was a larger trade being done by outsiders than by the insiders. In his (Mr. Samson's) judgment, the price was not nearly low enough yet. In an emphatic final sentence, he said "I have had enough of it; and I have resigned." To which a large section of the audience responded with hurrahs.

Mr. F. de la Fontaine Williams and Mr. Julius Moeller were heard on matters connected with the relations of the Company with the Austrian Company. The former in his remarks declared that the assertions of Mr. Samson regarding Baron Auer were perfectly outrageous; and the latter followed in the same strain. He also denied to Mr. Peters the honour of having been the first to suggest the policy of reduced prices, and agreed that the reduction was not at all detrimental to the shareholders.

The resolution was adopted with an insignificant opposition; and its passing carried with it the appointment of the Advisory Committee.

### Reduction of Directors.

A further resolution was passed reducing the number of Directors to five. It was mentioned by the Chairman that the Board had co-opted Mr. Frederick Clark; for none of the other Directors were prepared to sit at the same table again with Mr. Bethell. In a little appeal, Mr. Bethell asked the shareholders to leave his honour in the hands of the Advisory Committee. The question of the appointment of a Joint Managing-Director of the Kern Burner Company, Limited, was also left to the Committee.

The meeting, which had lasted two hours and twenty minutes, then concluded with a vote of thanks to the Chairman.

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## Story of the Company.

In view of Thursday's meeting, some extracts from an article that appeared in a recent issue of the "Financial News," containing a "Review of the Movement of the Enterprise from its Inception Up to Date," will not be without interest.

Our contemporary remarks: The real inwardness of the present position of the Welsbach Company is only apparent to those who have been able to devote a good deal of attention to the course of its affairs since it first came before the investing public. As the number of these close observers must be very limited, and as a very large body of shareholders ought to be properly informed on the subject, it will be useful at the present juncture briefly to sketch the history of the Company, omitting certain negotiations and arrangements which took place before its inception, and which will form the subject of a future article.

The Welsbach Incandescent Gaslight Company was registered on Dec. 9, 1897, to take over the businesses of the Incandescent Gaslight Company, the Austrian Incandescent Share Company, the Second Austrian Incandescent Share Company, and the Irish Incandescent Gaslight Company. The promotion of the concern was the result of proposals made to the Board of the Incandescent Gaslight Company, Limited (of which Major-General de la Poer Beresford was then the Chairman), by the Reconstruction Guarantee Company, Limited. The last-named concern was formed for the purposes of this promotion, with a nominal capital of £100,032 in 10,000 "A" shares of £10 each, and 32 "B" shares of £1 each. The influential shareholders in the

Company seem nearly all to have resided in and about Manchester; and their acknowledged leaders were Mr. C. L. Samson, a Manchester Solicitor, who was, until Saturday last, when he resigned, a Director of the Welsbach Company, and Mr. Harris, an Accountant, of Dublin. The Syndicate approached the then Incandescent Gaslight Company, offering to join its interests with those of other similar concerns, and place the whole of the enterprises on a sound financial basis. As a pledge of the seriousness of its intentions, it put up a forfeitable deposit of £50,000. Terms were agreed; and the Reconstruction Guarantee Company proceeded to make the necessary arrangements for the raising of the very large capital—amounting to £3,500,000—for the new Company. But it was soon discovered that the Syndicate had taken upon itself rather more than it could perform. The underwriting proved difficult to arrange; and the outlook for the promotion began to wear anything but a cheerful aspect. In their dilemma, the Reconstruction Guarantee Company approached Messrs. W. Greenwell and Co., the well-known stockbrokers, who looked at the enterprise, and offered to give it their assistance on condition that Sir Henry Burdett became Chairman of the Board. It had been understood that the Board of the Incandescent Gaslight Company would remain in control of the new concern; so that this stipulation raised another difficulty. Matters were, however, arranged; and Sir Henry Burdett became Chairman of the new Company—making on his own behalf the stipulation that he should have control of the whole of the secretarial staff, of the finances, and, in fact, of the general organization of the Company. The issue was therefore made in December of 1897. The Board at that time included (besides Sir Henry Burdett) Major-General de la Poer Beresford, who had been the Chairman of the old Company, Mr. A. Bethell—whose presence on the Board was the ultimate result of assistance given by him in connection with a subscription at a critical moment for £15,000 worth of debentures of the old Company—Mr. L. R. de Fonblanque, the Secretary of the old Company, Lieutenant-Colonel W. P. Ellis, Mr. J. Moeller, the General Manager of the old Company, and Mr. F. de la F. Williams.

The Company started very heavily loaded. It had to pay £40,000 in commutation of services to the officials of the various Companies which it had incorporated. The stipulation was originally for payment in cash; but satisfaction was ultimately accepted in shares. Messrs. Moeller and Williams had been interested in the business of one of the constituent Companies; and it was agreed that they should have £20,000 each in shares. Other persons received large sums for the surrender of their commissions; and contracts were entered into with them at large salaries, which were to be paid by the new Company. Dr. Auer held the controlling interest in the Vienna Company, which, it had been provided, should remain in his hands even if he did not retain the majority of the shares. For commutation of this controlling interest, Dr. Auer received £50,000. Of course, the new Company had also to pay the promotion profits; and it is impossible to ascertain exactly what these amounted to. We believe, however, that £365,000, *plus* the premium obtained on many sales of shares, is about the correct figure. From this, there would have to be deducted the expenses of advertising and other expenditure incidental to the issue. If we take these expenses at the very large (not to say excessive) figure of £100,000, there will still remain a profit of £265,000 out of the transaction for the Reconstruction Guarantee Company, Limited. As only £6500 "A" shares were allotted, and only £5 per share called up, then, if this estimate of the profits be correct, Mr. Harris should have had £32,670, Mr. Samson £8100, and Mr. Weguelin and his partners over £74,000 out of the promotion. The whole of the "B" shares, which would be entitled, under the Articles, to £2650 per £1 share, were held by a Mr. H. T. Cooper; but whether Mr. Cooper was the real holder, or whether he only held for other people, and, if so, who those other people were, it is impossible to say.

As time went on, a number of large shareholders were said (on somewhat dubious authority) to have become dissatisfied with the position of affairs; and a Committee was called into existence. It succeeded, in July, 1899, in introducing three new members to the Board—Messrs. Harris and Samson (who had both been interested in the promotion), and Mr. Peters. The proceedings of the Board were not henceforth characterized by great harmony; and ultimately an arrangement was come to among its members (shortly before the general meeting of 1900) that anyone should resign on being requested to do so by a majority of his colleagues. We believe we are correct in saying that such a request was ultimately made to Mr. Bethell, who, however, declined to accede to it at that time, on the ground that the agreement could not be maintained at law.

However, one of the earliest results of the appointment of the new Directors was the appearance of Mr. Peters in the *rôle* of Managing Director of the Company, about eighteen months ago. A great deal was expected from this appointment. So much, indeed, that at the last meeting Mr. Peters expressed himself as willing to stand or fall by the result of the next year's trading. "I can only ask you," said Mr. Peters, "to judge of the wisdom of your Board in selecting me for the management of your affairs by the results that I am able to put before you in future." And, again: "I must ask you," said Mr. Peters, "so far as I am personally concerned, for patience for twelve months before I can show you any results." Messrs. Samson and Harris fully identified themselves with this sentiment. Mr. Samson, in making a statement with regard to the future policy of the Company, linked the names of the three gentlemen together—"Mr. Peters, Mr. Harris, and myself," said he. A few months later—in the autumn of last year—Mr. Harris resigned. Now it is announced that while the turnover of £312,000 for last year produced a profit of £60,000, the turnover of £315,000 produced for this year less than no profit at all. Mr. Peters was pledged to "stand or fall" by the result of the year's work; and it is presumably because it has not come up to his expectations he has resigned, and his colleague, Mr. Samson, has resigned with him.

**Bridgwater Water Supply.**—On the recommendation of the Water Committee, the Bridgwater Town Council have agreed to take steps to obtain the sanction of the Local Government Board to borrow £4000 for the provision of mains for supplying water to the parish of Bridgwater Without, and £3000 for a water-waste prevention system.

## EDINBURGH AND LEITH GAS COMMISSIONERS.

### Annual Accounts—Visit to the Granton Works.

On Monday last week, the Edinburgh and Leith Gas Commissioners held their Monthly Meeting—Lord Provost STEEL presiding. The Treasurer (Mr. John S. Gibb) laid on the table a proof, subject to audit, of the accounts of the Commission for the year ending May 15.

Bailie MANCLARK, of Leith, moved that the accounts be remitted to the Finance and Law Committee for consideration and report, in accordance with the usual practice. The Commissioners were, he said, in a much better position than they anticipated twelve months ago. It would be remembered that the price of gas was raised by 4d. per 1000 cubic feet, and they were to make a draft upon the £28,000 they then had in hand, otherwise they would have required to raise the price of gas by 7d. He was very glad to be able to say that they had only drawn upon the fund to the extent of £11,000. He thought the Commissioners were to be congratulated on this state of matters. Had they raised the price of gas by 7d., they would possibly have checked the consumption.

Sir A. M'DONALD said he observed that the price of gas was being reduced in a number of places.

The ENGINEER (Mr. W. R. Herring) said he thought they would be in a similar position in the autumn, which was the time they fixed the price of the gas.

The accounts were remitted to the Committee.

Copies of them were sent out on the same day, and accompanying them was a note by the Treasurer, in which he stated as follows:—

| | | | |
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| The gross surplus on the year's working is | | | £42,156 11 2 |
| There has been paid during the year— | | | |
| For Edinburgh and Leith annuities. . | £32,561 2 6 | | |
| ,, Edinburgh-Portobello gas annuities | 1,127 8 0 | | |
| ,, Amount transferred to sinking fund in respect of annuities redeemed | 1,511 9 6 | | |
| ,, Do. in respect of mortgages redeemed | 570 3 0 | | |
| ,, Interest on mortgages, &c. . . . | 17,259 1 1 | | |
| ,, Expenses of mortgages . . . . | 663 19 8 | | |
| | | 53,693 3 9 | |
| Showing a balance against the year's income of . . . | | | £11,536 12 7 |
| This being taken from the amount brought forward from 1899-1900, after deducting contributions to sinking funds | | | 28,349 7 1 |
| Leaves the sum at the credit of profit and loss account . | | | £16,812 14 6 |
| This is subject to the statutory minimum charges for the sinking funds as follows:— | | | |
| (1) For repayment of money borrowed (20/- per cent.) . . . . . | £3296 10 7 | | |
| (2) For redemption of annuities (15/- per cent.) . . . . . | 7106 0 11 | | |
| | | 10,402 11 6 | |
| This being deducted from the above sum, leaves a balance of which may be dealt with by the Commissioners in terms of their Act. | | | £6410 3 0 |

The foregoing statements are made on the basis of the suspension, for this year, of the contribution to the sinking fund, as regards money expended on the Granton works. If the Commissioners should resolve to make this contribution, as they did last year, a further sum of £2875 19s. 10d. would have to be taken from the above £6410 3s., leaving a free balance of £3534 3s. 2d. You will remember that in September last, when fixing the price of gas for the year after October, it was found, from the great increase in the cost of coal and oil, that the Commissioners had to face an estimated deficit of £52,000=7¼d. per 1000 cubic feet. After careful deliberation, the Commissioners resolved to increase the price by only 4d., and draw for the remaining 3¼d. on the working balance of £28,349 brought forward from the year ended May 15, 1900; thus practically returning to the public £23,353 of the profits of previous years. The result, you will be pleased to notice, has justified the wisdom of the course pursued. By a substantial increase of income from gas sold, as well as by careful economies in various directions, the actual deficit on the year's working is, as above, £11,536 12s. 7d., in place of £23,353 as estimated; so that our available balance at the 15th of May last is £16,812, in place of the £5000 it might have been.

The accounts show the stock capital account to amount to £352,870 3s., upon which annuities to the amount of £33,580 18s. are payable. The account was originally £370,000, with £35,200 of annuities; but £17,129 17s. has been paid in redeeming £1619 2s. of annuities. Of £800,000 of authorized loan capital, £608,002 has been raised by mortgage; there is a sum of £9250 upon deposit receipt; and £20,770 is the amount of mortgages redeemed out of the sinking fund. The sum remaining to be borrowed is £161,978. The total capital account amounts to £1,008,022. The capital expenditure during the year was as follows: At Granton (in course of construction), £110,917 7s. 6d.; on mains and services, £22,190 19s. 7d.; on meters, £3846 5s. 6d.; and on gas cooking and heating stoves, £3459 6s. There was no capital expenditure upon existing works or holders.

The revenue account amounts to £323,400 6s. 9d. The quantity of gas sold was 1,764,445,400 cubic feet; and the revenue from the sale of gas was £280,843 10s. 7d. Coke realized £21,482 7s. 1d.; tar and ammoniacal liquor, £20,269 8s. 9d.; and waste lime, £10 3s. 6d. The balance of revenue was made up of rents of heritable properties and transfer fees. On the expenditure side, coal (166,289 tons) cost £141,043 10s. 3d.; oil, for making carburetted water gas (2863 tons), £15,454 8s. 1d.; purifying materials, oil, water, and sundries used at works, £10,128 4s. 6d.; salaries, wages, and charges at the works, £50,154 17s. 5d.; and repairs and maintenance of the works and plant, £11,204 13s. 8d.—making a total charge for the manufacture of gas of £227,985 13s. 11d. Distribution cost: Salaries and wages £12,508 16s. 10d., repairs and maintenance of pipes and attendance at gasholders £4878 2s. 5d., and repairs and maintenance of meters £5810 2s.—a total of £23,197 1s. 3d. Management cost: Salaries and wages £5347 3s. 6d., and general establishment charges £4376 19s. 11d.—a total of £9724 3s. 5d. Feu duties amounted to £398 16s., rates and taxes to £12,096 15s. 5d., pensions and allowances to £450, allowances to old employees £291 9s. 11d., allowances to families of army reservists £334 1s. 8d., law and parliamentary expenses £159 10s. 4d., accidental

damages £33 10s. 10d., and discounts, abatements, and bad debts £6572 12s. 10d. The total expenditure was £281,243 15s. 7d. The balance carried to the profit and loss account, after the total expenditure, was £42,156 11s. 2d. The sinking fund for repayment of borrowed money amounted to £24,780 19s. 10d.; but £20,770 has been expended in repaying mortgages (of which £4450 was expended last year), leaving the fund at £4010 19s. 10d. The sinking fund for redemption of annuities amounted to £130,003 3s.; but £47,789 4s. 9d. has been expended in redeeming annuities (of which £10,510 6s. 7d. was expended last year), leaving the fund at £82,213 18s. 3d. The gas stove account shows an outlay of £5439 1s. upon stoves during the year, and of £3362 7s. 8d., less £1500 charged against revenue account, upon repairing and fitting-up gas-stoves. The amount received for the hire of stoves was £2649 2s. 6d., for stoves sold £895 4s., and for fitting-up gas-fires, &c., £297 16s. 2d. The value of stoves, &c., on hand or lent on hire is £17,390 14s. 4d.

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At the close of the meeting, the Commissioners drove to the works which are in course of construction at Granton. There it was found that very great progress had been made since the last visit of the Commissioners in March of this year. First of all, the permanent railway is being put down; and this facilitates the delivery of large quantities of materials. The ground is littered with retort-house fittings, including piles of retorts. The buildings of the retort-house and coal-store, for the first section, are practically completed. The retort-bench of 56 ovens has been built. It is a solid structure, very heavily clamped in iron; and the iron gangways attached are so far completed that they can be made use of by the workmen. Of these there are a great many—80 bricklayers and 60 labourers—at work on the ovens, building the furnaces and flues. In no case has the stage of setting the retorts been reached; but it should be in a week or two. The foundations for the exhauster plant and the scrubbing machinery are being put in. In the coal-store, where there is to be accommodation for about 20,000 tons, the coal-conveyor in the roof is so well on towards completion as to enable to be seen how the coal can be delivered at any part of the house. There is provision for a coal-breaker at the end of the store; and part of the machinery is already in position. To enable work to be carried on independently of the coal-store, breakers and an elevator have been placed in the open space between the retort-house and the store. These are served by two lines of rails; the waggons tipping on to a moving platform, which carries the coal into the breaker. This platform extends, at the end furthest from the breaker, into the coal-store, from whence coal may be fetched whenever it is desired to work from the store. To the north of the carbonizing house, and running at right angles to it, is the purifier-house. The building of it has been begun; and the concrete foundations are ready for the boxes to be put upon them. The house is to be two storeys in height; the upper flat being used as a store for lime and oxide. North of the purifier-house are two buildings in line with each other. The one is a pumping-station, to be used forthwith for the purpose of bringing gas from the existing works in Edinburgh for storage at Granton, and, after the Granton works have begun carbonizing, for sending the gas into the city. This building is well advanced; but not much has been done in the laying down of plant. In the other building are to be the station meters. There is room for four. Only one is to be proceeded with in the meantime; but all the underground arrangements have been made for the four. Close beside the meter-house is the gasholder. It is in the most advanced stage of all; the Contractors (Messrs. Clayton, Son, and Co.) having pushed forward their work with great vigour. The holder itself is practically completed, only about a single row of plates in the roof being still to place. The guide-framing—about 170 feet in height—is completed, with the exception of the ornamental tops; and the guiding rollers are ready to be fixed. The company walked into the holder, and were greatly impressed with the appearance of the place. The cavity is 252 ft. 6 in. in diameter; and the depth of the tank is 40 feet. It was found that the acoustics of the place were remarkably good. It is expected that the holder will be completed by the beginning of September, and will be open for inspection by the Institution of Gas Engineers, on their way to the Engineering Conference in Glasgow. The holder is in four lifts, and is of 6¼ million cubic feet capacity. The last place visited was the residual works, which are now in operation; the ammoniacal liquor being brought in railway tank-waggons from the Edinburgh and Leith works. The plant is all operating satisfactorily; the ammonia produced being of a high degree of whiteness, and perfectly friable. The process is an enclosed one; and there is, consequently, an almost entire absence of smell in the house. Here, as elsewhere, mechanism is brought into use to such an extent that manual labour is almost unknown. The visitors were greatly impressed with the completeness of all the arrangements, and with the adaptability of the buildings and machinery for the purposes for which they are intended.

Lord Provost STEEL, when the inspection was over, said he thought they ought to compliment the Convener of the Works Committee and the Engineer upon the state of the works. He believed that when they were completed there would be very few gas-works in the country to compare with them. It had required a great deal of foresight on the part of their Engineer to get all the materials and machinery forward at the right time. He was perfectly sure that Mr. Herring had been working very hard, and that he deserved their warmest thanks, and their confidence, for the way in which he was carrying on the undertaking. He was sure the Convener had the business at heart, and was endeavouring to get the works ready for occupation by the time specified. Then, he was satisfied, the works would prove a very great saving to the Commissioners.

Mr. PURVES, the Convener, said that the Engineer and himself were very much indebted to them all for what they had done that day. The works were further advanced than they had thought possible. The new holder would be equal in capacity to all the other holders they had. It would give them an elasticity in working which would be of great benefit. In so far as the carbonizing department was concerned, they knew that it had to be started firing very slowly; and they expected to get fire applied to it before this year was out. They had seen the sulphate works. They were getting these adjusted so as to produce 20 tons of sulphate per day. It was a department the Commissioners had not hitherto had; and he thought that it would be a valuable source of revenue. Altogether, he believed, if they were spared till this time next year, they would see as good a works as any in the country. But he must say that it was to Mr. Herring alone that they were indebted for these grand works.

Mr. HERRING said he did not think there was any doubt as to their getting the new works started by about the end of next March. There was nothing, so far as he could see, which should prevent it. The machinery was all ordered, and was coming in quite satisfactorily; and he quite expected that they would be able to begin in a quiet manner by the time he had stated. In that way, they would be able to bring the works gradually into use—to get the weight gradually upon them. They would then probably shut down the Leith works, perhaps about midsummer. After that, the new works would be capable of producing, at the maximum, 10 million cubic feet of gas per day. This was very nearly their total daily output; and so they would only need the Edinburgh works in the winter. Probably they might go on in that way for a year or two, before they proceeded to the erection of a second section at Granton.

Mr. JOHN JAMIESON proposed a vote of thanks to Lord Provost Steel for the interest he took in the new works, as in all the constructional work which the Corporation were engaged in.

Lord Provost STEEL acknowledged the vote in a few words.

## ORIENTAL GAS COMPANY, LIMITED.

### New Contract Signed—Modernizing the Articles of Association.

An Extraordinary General Meeting of this Company was held last Wednesday, at the London Offices, Finsbury House, Blomfield Street, E.C., for the purpose of considering, and, if thought fit, approving, a draft of new regulations, in place of the present Articles of Association. Mr. R. HESKETH JONES presided.

The CHAIRMAN, before commencing the business for which the meeting was convened, remarked that he wished to make an announcement with reference to the public lighting contract for Calcutta. It would be recollected that this matter had been before the shareholders for some four or five years past. The Directors put in a formal tender in December, 1899; and he now had pleasure in informing the shareholders that the tender had been accepted, without any variation whatever. The matter had been before the Municipal Council of Calcutta; and there had been some correspondence and so forth. With the view of making some announcement that day, the Directors cabled to Calcutta on Monday; and on Tuesday they had the gratification of receiving this telegram: "Contract signed all right."

The SECRETARY (Mr. H. J. Luff) then read the notice calling the meeting.

The CHAIRMAN said the shareholders had received a circular explaining the reasons for convening the meeting. It pointed out that the existing Articles of Association were antiquated, and that, if they were amended as now proposed, the Directors would be able, if it was the pleasure of the shareholders, to convert the present shares into a uniform consolidated stock. He called upon Mr. Hollams (of Messrs. Hollams, Sons, Coward, and Hawksley) to read the heads of the different clauses contained in the Articles.

Mr. HOLLAMS said at present the Company's Articles were very peculiar, and had been amended a great many times, so that there was some confusion. The new Articles had been prepared and considered with great care by the Directors; and, further, they had been submitted to Mr. Palmer, the eminent Company barrister, who approved them. Mr. Hollams then called attention to the heads of the clauses; but, as many of them are purely formal, the whole of his remarks need not be reported. In referring to the constitution of the Company, he mentioned that it was formed in 1853. As the Chairman had pointed out, power was taken in the amended Articles to enable the shareholders to reduce the capital, and to wipe out the liability on the existing shares. The statutable provisions were embodied as to the forfeiture of shares in the event of non-payment of calls; but this would become unimportant and inoperative as soon as the capital was reduced. Under the new Articles, the Company would be enabled, by special resolution, to reduce the capital by paying off or cancelling capital which had been lost or was unrepresented by available assets. If they had had this provision in the existing regulations, they could at once have proceeded to reduce the capital; but unfortunately they had not, and so they had first to get the power, and then the shareholders would have to be called together to pass the necessary resolutions for reduction. They could not do this under the Act of Parliament unless it was authorized by the Articles. Then there was the power, which would follow on that, to convert the shares into stock. Of course, shares could not be converted into stock until fully paid up; and when they were reduced, they would rank as fully paid-up shares, and could be converted into stock, to the great convenience of everyone. Then several ordinary provisions were followed by one which provided that the number of Directors should not be less than five nor more than seven; their qualification being £500 of paid-up capital, with the same remuneration as at present. All the succeeding provisions were purely formal.

Only one question was put, and that was by Mr. Samuel Spencer. It elicited a reply showing, as an example, the antiquity of the regulations in respect of the filling of a vacancy in the directorate. At the time of the last general meeting, the Chairman pointed out, Mr. J. Blackett Gill the late Chairman, had just died; and it was left to the Directors to fill the vacancy. They did so shortly afterwards; but, by the rules, they had to post the elected gentleman's name in the office, so that it was exhibited to all comers until the next meeting in November. This was one of the absurdities that had been eliminated from the new Articles.

On the motion of the CHAIRMAN, seconded by Mr. H. D. ELLIS, resolutions were passed approving of the new regulations, and adopting them to the exclusion of all existing ones.

This concluded the proceedings.

## EXAMINATIONS IN GAS MANUFACTURE.

### The Pass List.

We have received from Sir Philip Magnus, the Superintendent of Technological Examinations of the City and Guilds of London Institute, the following lists of the successful candidates at the last examinations in "Gas Manufacture" conducted by the Institute. The question papers set by the Examiner (Dr. Harold G. Colman) were given in the "JOURNAL" for May 7, p. 1244.

HONOURS GRADE.

*First Class.*

| | | | |
|---|---|---|---|
| Barnes, F. V. | Folkes, T. D. | Longbottom, W. | Sainsbury, E. A. |
| Comely, A. N. T. | Hendrickson, A. | Mead, A. | Stanway, B. |
| Dickson, J. | Holland, J. | Port, H. N. | Theobalds, V. W. |
| Edwards, A. | Johns, W. H. | Reece, T. H. | Townsend, W. W. |

*Second Class.*

| | | | |
|---|---|---|---|
| Auchterlonie, J. W. | Gray, J. A. | Nisbet, A. S. | Swallow, F. W. |
| Bottomley, J. W. | Hawkyard, F. | Nuttall, L. W. | Thomson, W. |
| Brettle, J. | Ireland, C. L. | Ratcliffe, H. C. | Thorman, J. S. |
| Clowes, C. P. | King, B. J. | Ruggles, H. G. | Walker, T. B. |
| Garlick, D. E. | Moys, H. | Scarth, P. F. | Whyte, J. N. |

ORDINARY GRADE.

*First Class.*

| | | | |
|---|---|---|---|
| Armstrong, J. | Down, S. W. | Mitchley, J. W. | Thomas, C. |
| Bates, W. | Hardcastle, F. | Morris, W. W. | Thomas, H. J. |
| Bromley, A. | Herring, C. G. | Morton, A. | Turner, A. |
| Brooke, T. | Hoy, H. | Pargest, T. H. | Walmsley, P. D. |
| Burroughes, B. H. | Hutchinson, E. | Phillips, E. T. | Ward, F. E. |
| Chadderton, F. | Ingham, R. | Pickford, H. | West, E. |
| Collins, R. H. | Ireland, J. | Ramsden, R. S. | White, W. A. |
| Creed, E. C. | Jennings, F. R. | Reid, N. | Wilkinson, H. |
| Cunnington, W. | King, P. A. | Roberts, W. E. | Wills, J. H. W. |
| Davies, D. H. | Lang, J. | Scears, E. | |
| Davies, H. R. | Mayne, G. F. W. | Taylor, F. W. | |

*Second Class.*

| | | | |
|---|---|---|---|
| Bird, F. E. | Elliott, F. | Morris, E. V. | Royle, H. M. |
| Bowden, R. | English, E. | Newton, G. H. | Rylance, H. |
| Brook, A. S. | Fligg, C. H. M. | Newton, W. H. | Simpson, J. |
| Browne, P. J. | Frost, W. | Peace, W. | Thornton, T. |
| Buxton, R. W. | Galbraith, W. | Poll, W. | Townsley, J. |
| Chisholm, J. | Hain, A. D. | Prince, R. S. P. | Vere, M. C. |
| Churchill, H. F. B. | Lancashire, P. | Prouse, A. H. | Walker, G. H. |
| Clark, P. B. | Lancaster, H. W. | Reid, F. | |
| Cooper, C. | Lander, J. | Richford, J. W. | |
| Dawson, G. R. | Law, J. K. | Robinson, F. H. | |

## DISCHARGING WASTE GAS LIQUOR INTO THE SEWERS AT CANTERBURY.

At the last Meeting of the General Purposes Committee of the Canterbury Corporation, a letter was read from the Secretary to the Gas and Water Company on the subject of some recent complaints regarding the discharge of gas liquor into the sewers. The letter stated that the Directors were most desirous at all times to carry on the manufacture of gas so as not to annoy or inconvenience persons in the locality, and that every effort was, and would be, made to prevent any nuisance arising.

It subsequently appeared that the Medical Officer of Health, the Surveyor, the Public Analyst, and the Sanitary Inspector had visited the gas-works and interviewed the Manager. They were shown the arrangements for purifying the gas from sulphur compounds, and also those connected with the manufacture of sulphate of ammonia, and the disposal of the waste liquors resulting. They visited certain houses from which complaints of offensive smells had been received. As regards the complaints, the officials were of opinion that the smells probably proceeded from the ventilator to the tar and liquor well. The shaft has since been increased in height 18 feet; and this may have the effect of minimizing the nuisance complained of. They unanimously arrived at the following conclusions: "(1) That the smell observed in all the instances is due mainly to volatile sulphur compounds in the form of waste liquors, resulting from the manufacture of ammonium sulphate, which waste liquors are discharged at certain intervals into the sewers, and the fumes from which issue from the sewer ventilators, and cause the atmosphere in the immediate neighbourhood to be offensive, besides entering into some of the houses by means of the drainage; (2) that the admission of such offensive liquors into the sewers is objectionable, and that the smell itself is, in the opinion of the Medical Officer, prejudicial to health; (3) that the ventilation of the public sewers in question is altogether insufficient, and requires immediate extension; (4) that in the case of certain houses from which complaints have been received, the private drains were in a defective condition and not ventilated, and permitted the escape of the above offensive gases; (5) that, in the event of the Gas Company continuing to send such waste liquors into the sewers, they ought to adopt a process of *automatic flushing* adequate to convey the same as far as, and as soon as, possible from the point of discharge, and also subject the same to some previous deodorizing treatment." The Medical Officer went on to emphasize the importance of ventilation of private house drains by owners of property. At two houses he specified, which had no private ventilators, the nuisance was very troublesome; but at an intervening house, which had a private ventilator, there was no smell and no complaint.

Mr. H. C. Page, the Engineer to the Company, wrote to the effect that the different processes carried on at the works were not in any way peculiar to Canterbury, but are in use at gas-works generally all over the kingdom. They are also subjected to the supervision of the Alkali Inspector, who pays surprise visits, and who would very soon raise objection were anything done contrary to law. The complaints, he said, appeared to have arisen in two different sections of the city: (1) In Castle Street, and (2) on and outside the line of sewer running from the works. As regards the former complaint, if any portion of the nuisance could be traced to the works (which is somewhat doubtful) he could only attribute it to the fact that during that particular time the wind was bearing right down upon the ventilating shaft of the tar and liquor well, and taking the gases over Castle Street—the atmosphere at the same time being very heavy. It was absolutely necessary for the safe conduct of the works to have this ventilating shaft; and in order to minimize any inconvenience arising therefrom, they had now carried up the shaft about 18 feet higher, hoping thereby to effect an improvement. He added that, although an unpleasant odour was given off by the tar and liquor tank, he thought it was not prejudicial to health, as tar was largely used in purifying and disinfecting agents. With reference to complaint No. 2, on and outside the line of sewer from the works, this was entirely a matter for the Corporation, and he was convinced, from personal inspection, that until the defective sewer was relayed further complaints would arise. No effluent liquor of any kind had been poured into the sewer for more than fourteen days prior to the complaints, and this was in itself sufficient evidence to show that the sewer was defective; as while working the sulphate plant and turning into the sewer a quantity of fluid (thus keeping it clear) no complaints arose, but only after the plant was shut down. The reason of this was that the sewer was practically dead-level, more than half silted up in places, and had a number of leaky joints. Consequently any matter put into it could not get away, and remained to be stirred up time after time, causing smells in the various houses. The area supposed to be affected by the works was, in his opinion, absurdly exaggerated. The effluent liquor was much diluted by clean water while running into the sewer, over 4000 gallons per day of the latter being poured in. This course of procedure was not adopted in many works, but was necessary at Canterbury owing to the bad state of the sewer. When working the sulphate plant again, Mr. Page proposed to pump the liquor over and over, so as to bring it in contact with steam and lime. By this means it would be rendered practically odourless; all the waste gases passing through the purifiers in the ordinary course. In conclusion, he said: This sulphate process has been in use at these works for more than forty years; and no change in the working has been made during the last ten years, when new plant was erected. If the manufacture of sulphate was discontinued, a very serious nuisance would arise, as formerly was the case, from the necessity of removing the ammoniacal liquor, which would have to be carted through the streets.

The MAYOR suggested that a copy of the report from the Corporation officials should be sent to the Directors of the Gas and Water Company, who, he felt sure, would do their utmost to prevent any nuisance occurring. Public sewers had to be provided; and if the liquid were innocuous there could be no objection to the Company using them. It would be the duty of the Corporation to attend to any defects there might be in the sewers.

Mr. RUSSELL inquired whether they were compelled to take the liquor into the sewers.

The TOWN CLERK replied that, if the Medical Officer said it was injurious to health, the Company would not be allowed to pass it into the sewers under a penalty of £10 a day.

Mr. GODDEN concurred in the proposal to send a copy of the report to the Directors of the Company; but he thought the main duty of the Council was to consider whether the liquor ought to be passed into the sewers at all. That was the crucial point. They had to think of the health of the citizens; and the plea that the sewers were not sufficiently ventilated was no answer at all to the position which had occurred through this act of the Company. Supposing that the liquor was rendered inodorous and the injury to health thereby removed, they had also to remember that the liquid was reported to be very prejudicial to the crops growing at the sewage irrigation farm, and also to the general system of works. He thought that they should seriously consider the legal position of the matter.

The TOWN CLERK thought that the Mayor's suggestion was the right one to adopt—send a copy of the report, and also draw attention to the provisions of the Public Health Act of 1890. They must, he considered, do that in the first instance.

It was agreed that this should be done.

## KENDAL CORPORATION GAS AND WATER SUPPLY.

### A Satisfactory Report.

At the Meeting of the Kendal Corporation last Tuesday, the Gas and Water Engineer (Mr. T. N. Ritson, Assoc.M.Inst.C.E.) presented his report on the working of the undertakings in his charge during the year ending the 31st of March. In the course thereof, he stated that the total receipts on revenue account amounted in the Gas Department to £12,886, and the expenditure to £9546; leaving a gross profit of £3340. Interest upon debentures, loan (expenses of Act), bank interest and commission, and the sinking fund absorbed £2485; leaving a surplus of £855. The expenditure on capital account amounted to £1546. The reserve fund now stands at £3347; and the sinking fund (including debt repaid) at £4691. The gas made was 70,770,700 cubic feet; being an increase of 4,881,900 cubic feet, or 7·40 per cent., over last year. The total number of consumers on the books at the close of the year was 2433—viz., 1615 by ordinary meters and 818 by prepayment meters—showing an increase of 147. The output of gas was 4,051,555 cubic feet, or 6·69 per cent., more than in 1899-1900; and the income from the sale of gas was £481 more. The gross profit for the year was only £33 less than before, which is very satisfactory, considering the heavy increase in the cost of coal. During the year 64 boiling-burners and 159 grillers and their accessories were supplied free of cost to consumers, and 157

houses were fitted up on the hire system. The receipts for coke showed a substantial increase, due to the advance made in the price. Sulphate of ammonia fell off, owing to lower prices ruling during the year, and to defects in the manufacturing plant. Fresh plant is now being erected, and will shortly be in operation. The new gasholder is progressing satisfactorily. The total receipts on revenue account in the Water Department amounted to £3335, and the expenditure to £2149; leaving a gross profit of £1186. Interest on debentures, bank interest and commission, and loan (expenses of Act) absorbed £1901, and sinking fund £646; leaving a deficiency on this department of £1361. The reserve fund now stands at £1055, and the sinking fund (including debt repaid) at £3368. The expenditure on capital account for the year was £3845, of which £2161 was on account of the Fisher Tarn new reservoir scheme. This reservoir was kept full of water throughout the year. The reservoirs at Bird's Park, also the engines, boilers, and pumping machinery at Mint's Feet, have been maintained in an efficient condition.

## LABOUR TROUBLES IN NEW ZEALAND.

In conjunction with the article headed "Compulsory Arbitration in Trade Disputes" which appeared in the "JOURNAL" for June 18, the following information, which Mr. F. G. Ewington, of Auckland, the New Zealand correspondent of the Liberty and Property Defence League, lately forwarded to the Secretary (Mr. F. Millar), upon the failure of compulsory arbitration in that colony, will doubtless be perused with interest: "While his Honour Judge Backhouse, the Royal Commissioner appointed by New South Wales to inquire into the working of the New Zealand Compulsory Conciliation and Arbitration Act, is here, the 'Evening Star' has fallen into an error—inadvertently, no doubt—by alluding to this as 'a land without strikes.' Of course, everybody knows we have only just had a bricklayers' strike in Auckland; that in October last all the newspapers reported on the 18th and 19th a painters' strike at Hastings; two gold miners' strikes at Nelson; a coal-truckers' strike at Greymouth; and a strike of ballast hands on the Grey-Hokitika Railway. Some time before that, the workmen actually struck at the Parliamentary Buildings, Wellington. So it is a mistake to say we have no strikes. The misstatement is frequently made in England. But we have a condition of industrial affairs in New Zealand which is worse than strikes. The country is in a state of turmoil. Thirteen cases are awaiting the Arbitration Court in Christchurch; the Board of Conciliation in Auckland has got its hands full for three months ahead; and other parts of the colony are also seething with industrial disputes. The boot manufacturers' dispute in Christchurch will affect the whole colony. The Trades and Labour Conference, moreover, passed a resolution last month to the effect that all Government employees be brought under the provisions of the Arbitration Act. Hence in the 'New Zealand Herald' of April 27 last it might well be said: 'The fact is there is industrial veiled war and unrest from Auckland to the Bluff.' Mr. John Ross, one of the Vice-Presidents of the Industrial Association, and a great 'captain of industry,' recently said that conciliation had, in fact, been a failure, and it would almost be better if it were swept off the statute-book. It seemed to him to foment troubles, and to create a deal of expense to no purpose. On the top of this, we have the Employers' Association and the Trades and Labour Council in Canterbury trying to set up a voluntary Industrial Conciliation Board. This is what the Auckland employers agreed with the Knights of Labour and the Trades and Labour Council to set up in 1891; and it is what will have to be done yet, because the present Act is doing much harm, and even some of the Unions consider the present Conciliation Boards useless, and want to go straight past them to the Arbitration Court. Unionist preference is gross injustice."

## ELECTRIC LIGHTING NOTES.

Increased trade in electric lighting has compelled the Bath Corporation to consider the question of extending the works. The number of 8-candle power lamps in use has increased from 17,802 at the end of 1898 to 31,360 at the end of May this year. And yet we do not think Bath can be placed among the financially successful municipal electric lighting undertakings. However, a Local Government Board inquiry has been held to deal with an application of the Council to borrow £4000 for the purpose of acquiring property adjoining the generating station.

At the last meeting of the Belfast Corporation Gas and Electric Committee, a letter was read from the Local Government Board in regard to a loan of money for the electric undertaking. The Board consented to the loan, but reduced the amount on account of the system which has prevailed of hiring-out motors. They strongly object to this system, and direct that it must be put a stop to. The sum to be allowed is £90,822, in three instalments, repayable in thirty years; and it is considered that this will be ample to meet the requirements of the department.

"When will the electric light be obsolete?" is the query put as the heading to a paragraph in the local paper which reports that Colonel A. G. Durnford, R.E., has held an inquiry on behalf of the Local Government Board at Cheltenham, respecting the application of the Town Council for sanction to borrow £25,000 for the purposes of electric light and supply to the tramway; also including an extension of the electric light works, additional machinery, and other works necessitated by the increase of private consumers. One tradesman objected on the ground that there should not be so many arc lamps, and that in a few years the light would be obsolete.

On the recommendation of the Electric Lighting Committee, the Barnstaple Town Council decided yesterday week to apply to the Local Government Board for sanction to a loan of £27,000 for electric lighting purposes. This is £5500 in excess of the sum recently estimated by Mr. W. H. Trentham, the Electrical Engineer, as necessary to provide not only for immediate requirements but for developments. Mr. Lake, a member of the Council, pointed out that the original estimate was £15,000; and he asked how it had crept up to £27,000. The Mayor said the £15,000 only related to the compulsory area, and it was not now intended to confine the scheme to the district.

The Engineer and Secretary of the Hertford Gas Company (Mr. R. Watson) would apparently be justified, judging by what has appeared recently in the local papers, in adopting the motto of the knights of the Order of the Thistle, for he does not allow anyone to attack him with impunity. An Electric Light Company are about to make a start in the town, and are, of course, canvassing vigorously for customers. It is at just this juncture that the "puff preliminary" in the newspaper circulating in the district proves valuable; and consequently we find "A Scientific Correspondent" rushing into print—from purely disinterested motives, no doubt—to show how vastly superior electric light is to gas. He talks pathetically about the poor gas consumer "fighting for the breath of life with a gas-burner," and, alas! "fighting a losing battle." To the consumptive and debilitated, we are told, gas means "early death." One advantage of the electric light upon which the "Scientific Correspondent" dwells at some length—and it will doubtless be appreciated to the full by the ladies of Hertford—is its power to preserve youthful freshness and vitality. Wrinkles, we are assured, are postponed for a decade, and neither the dowager nor the *débutante* in society is any longer exhausted at the end of a London season. This is satisfactory. We quite expected to find, at the end of the writer's long eulogy of his favourite illuminant, that, in addition to all its other advantages, it possessed the very important one of cheapness. But he is candid enough to admit that, in respect of cost, gas has the best of the comparison; though he proceeds to argue that its rival is really the cheaper illuminant in the end, if all its qualities are taken into account. The article by the "Scientific Correspondent" brought one in the following issue from Mr. Watson, who was not afraid to append his name to his communication. He began very appropriately by showing how the consumption of gas has grown from 66,613 million cubic feet in 1882—the date of the first Board of Trade returns—to 127,365 millions in 1899; and he very pertinently asked what, assuming gas to be entitled to all the opprobrious epithets, such as "poison," "dirt," and "foul illuminant," which the scientific gentleman had applied to it, people were thinking about in using it in such rapidly increasing quantities as his figures indicated. He followed up his question by suggesting the answer—viz., "Because they find it to be useful, efficient, safe, certain, cheap, and a good lighting, warming, cooking, and ventilating agent. All of which cannot be said of electric light." This is the whole case for gas, in a nutshell. But he added: "People generally are not without common sense; and the universal usage of the light gives the lie to much that the 'Scientific Correspondent' has advanced, and proves his language to be totally undeserved. It is almost axiomatic that, when a man employs violent language, he regards his case as weak. Such language is not clever, it is not correct, and it is not scientific." Dealing with the two illuminants from the hygienic standpoint, Mr. Watson had no difficulty in showing that the ameliorated health which he claimed as the result of the introduction of the electric light had been brought about to a large extent by improved dwellings, better sanitary conditions, and greater medical skill. He emphasized the value of ventilation, and showed how the gas-burner, by heating the air, and causing it to carry off the products of respiration and combustion, becomes in reality a medium for securing it; whereas the electric light allows the air, still charged with exhalations from the lungs, to remain virtually stationary. Of course, all this should have been known to the "Scientific Correspondent;" but it did not suit his purpose to confess it. On the question of the price of the two illuminants, Mr. Watson was able to give the results of some tests he had made, which showed that, light for light, electricity was 5½ times dearer than gas consumed with a Kern incandescent burner. This part of the subject, however, the "Scientific Correspondent" treated, as Mr. Watson characterized it, in a very "easy and never-mind" way. He admitted the advantage of gas from the point of view of its economy; but, in his desire to vilify a strong competitor, he chose to ignore its other manifest good qualities. This is not by any means an unusual attitude for opponents of gas to assume; and therefore Mr. Watson did well to step forward and defend his illuminant from the aspersions cast upon it.

## PLYMOUTH CORPORATION WATER SUPPLY.

### Proposed Increase in the Charges.

The Water Committee of the Plymouth Corporation have under consideration proposals for increasing some of the charges made for water. For, it is said, the first time in its history, the water undertaking has become non-productive. Before the construction of the storage reservoir at Burrator and the laying of the pipe-line which replaced the old Leat, the capital account was very low, and the undertaking yielded a fair profit to the Corporation. The increase of the capital account has, however, made a great difference; and this year, in spite of a steadily increasing revenue, it is anticipated that there will be a deficit of about £1000. In order to meet this, the Committee propose to increase the charge for water for trade purposes, and also to add to the charges for water supplied to various institutions. Water is furnished by meter for trade use at 2d. per 1000 gallons, which is said to be not only the lowest figure in the kingdom, but to be considerably below the actual cost to the Corporation. Dividing the expenditure of the year by the consumption for all purposes, the cost works out to 2¾d. per 1000 gallons. It is now proposed to charge 3½d. in the borough, and 6d. to manufacturers outside for water supplied by meter. The charge of 3½d. will, it is contended, still be the lowest in the kingdom. The other directions in which the charges are to be increased are for the supply of such institutions as the workhouse, the hospitals, and the various departments of the Corporation. In most of these cases the ratepayers will not gain any advantage from the additional revenue; but it is claimed that the effect of the changes will be to put the water undertaking on a business footing.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

At a meeting of the Edinburgh and Leith Gas Commission on Monday, a letter from the Secretary of the Incorporated Institution of Gas Engineers was read, in which it was stated that the Engineer to the Commission was the President of the Institution, and the wish was expressed to be allowed to visit the new works at Granton on the occasion of their visit to Glasgow. Monday, Sept. 2, was suggested as a suitable day for the visit. The letter was cordially received; and it was remitted to a Committee to make arrangements for the reception of the engineers. In the two months which have still to elapse, the works should be advanced considerably; and what the visitors will see ought to be some of the inclined retorts being placed in position, the coal-breaking and elevating machinery sufficiently advanced to give an idea of its working, a gasholder all but completed, and the residuals works in full operation.

The Commissioners themselves paid a visit of inspection to the new works at Granton after their meeting on Monday,* and were highly gratified by all they saw—as they might well be The new works occupy but a corner of the vast site of over 100 acres; the rest being under cultivation, and growing excellent crops. The city is invisible from the works, which lie on a gentle slope extending down to the shores of the Firth of Forth. The works are truly planted in the country, which has its advantage, in that it removes them from the neighbourhood of the dwellings of men. But the distance the workmen will have to travel will be a disadvantage. To overcome it, a railway station is to be erected within the works, replete with all the customary checking arrangements, and with an overhead gangway which will land the workmen at the door of the retort-house. What strikes a visitor to the works more than anything else, is the perfection with which every detail seems to have been thought out (which leads to delays being things that are almost unknown), and the provision which is made in all the departments for future extensions. If the satisfaction which is to be derived from the works is to be measured by the care that has been bestowed upon their erection, it will be of no small amount.

No better authority for the expression contained in the last sentence could be found than in the accounts of the Commissioners for the past year, which have been published this week. I do not overlook the services of the other officials of the Commission, all of whom have exerted themselves to the best of their ability to bring about as good a result as possible in a year of more than usual difficulty; but, remembering the statement that it is in the retort-house that dividends are made or lost, I must give the chief credit for the excellent result of the year to Mr. W. R. Herring, the Engineer. Using 4906 tons more of coal, but 390 tons less of oil for carburetting water gas, the sale of gas amounted to 28 million cubic feet more The coal account rose from £103,231 to £141,043; and the oil account, notwithstanding the decreased quantity, rose from £9969 to £15,454. In the works department, purifying materials also increased in cost from £9297 to £10,128; and salaries and wages, from £46,786 to £50,154. The only decrease was in repairs and maintenance, which fell from £12,986 to £11,204. There were thus net increases in the carbonizing department amounting to £45,732. Distribution cost £2911 more, management £883 more, feu-duties and rates and taxes £2584 more, and pensions and allowances £158 more. The expenditure side, as a whole, showed increases to the amount of £53,476. To meet this, there was an increase in the sales of gas to the extent of 28 million cubic feet, which would produce about £4500. The price of gas was increased in October by 4d. per 1000 cubic feet, which should have brought in an addition of about £18,000. Residuals were up £1800. Coke realized £8287 more; but tar and ammoniacal liquor fetched £6433 less. These calculations show that increases of revenue should have amounted to about £24,300; and, as a matter of fact, the increase of revenue was £26,175. That is to say that, while the expenditure increased by £53,000, the revenue increased only by £26,000. Thus both sides of the account were negative; yet the balance against the undertaking has turned out to be only £11,500. There must have been careful handling of materials to produce this result

A point which is not without interest is that the law and parliamentary expenses were only £159, as compared with £251; and the accident damages amounted to £33, as against £9. The Workmen's Compensation Act is not, as yet, lying heavily upon the shoulders of the Commission. The capital account of the Commission is increasing rapidly, owing to the new works; it having risen, in the course of the year, by £230,000. The whole of this sum was not, however, expended in the twelve months, as there was a heavy balance at the bank which had to be wiped out a year ago.

It is reported that the financial year of the Dunfermline Corporation Gas Department shows a surplus of about £800. This favourable state of matters is said to be due to the use of benzol by the Manager, Mr. Alexander Waddell; Dunfermline being one of the few places in Scotland where the process has been adopted. Along with benzol, it is said, Dunfermline splint coal (which is a local coal, and therefore cheap) is sufficient to keep up a high illuminating power. There is also the advantage of a better coke than can be obtained from cannel. Mr. Waddell has estimated for the current year to have an output of 4250 tons of coke, which, at 9s. per ton, will yield a revenue of £2034. Even if only 8s. be obtained, the yield will be about double what has hitherto been received for coke derived from cannel and Dunfermline splint. It is proposed to reduce the price of gas from 3s. 11d. to 3s. 6d. per 1000 cubic feet, and the differential rate from 3s. 4d. to 3s.; and to retain the prepaid rate at 4s. 2d. Even with these reductions, it is estimated that there will be a surplus of £2150 on the year's working—a very good record for Mr. Waddell's first year. A question may arise at the Council meeting as to whether the reductions in the price of gas should not be more than is proposed.

The Municipal Electrical Association held their sixth annual congress in Glasgow last week. On Wednesday, the Corporation of Glasgow entertained the delegates to luncheon in the Banqueting Hall of the City Chambers; and on the evening of the same day, the members held their annual dinner in the Windsor Hotel. Mr. W. Foulis, the Gas Engineer to the Corporation, was one of two gentlemen who responded to the toast of "Scientific Institutions." He said that, although he was specially concerned with gas, he had taken the deepest interest in all questions of electrical development. More than fifteen years ago, when electricity was only beginning to show itself, he predicted that electric lighting would become a very important industry. That prediction had been fulfilled. At the same time, he did not think the gas industry had suffered. There was plenty of room for both.

The Corporation of Perth opened an exhibition of gas cookers, fires, and other gas appliances for the saving of labour, in the City Hall yesterday. The exhibition differs from most of its kind in that it is not confined to the products of one firm, but contains the best from a number of the larger manufacturers of gas appliances. Lord Provost Macgregor performed the opening ceremony. Mrs. A. R. Stevens, of Liverpool, is the lecturer for the course of the exhibition, which is to be open till July 5.

The Falkirk and Larbert Water Trustees made their annual inspection on Tuesday last. The interest of the occasion was that the party were able to see the work which has been started for the construction of a new reservoir at Drumbowrie. It was stated in the course of the day that, since a plentiful supply of water was brought in from the Denny Hills, thirteen years ago, the Falkirk district had advanced by leaps and bounds. Manufactories have been rising up by dozens; and, in addition, the Corporation have been able to keep the community in a healthy condition. The water-rate was at first 1s. 6d. per pound; but it has now been reduced to 9d. Although they would probably expend £100,000 upon the present extension scheme, such has been the increase in the valuation of the district (it was £1000 last year), that the Trustees anticipate it will not be necessary to raise the water-rates.

A year or two ago a writer in a London newspaper asserted, with much force of language, that the sanitary arrangements of St. Andrews were very imperfect. The remarks of the anonymous writer were greatly resented; but, all the same, the Corporation have carried through an exceedingly important scheme of sanitary improvement, in the introduction of a very large augmentation to the water supply. The works required have been a new reservoir to contain 14 million gallons, raising the storage capacity from 3 to 17 million gallons, and providing a water supply for 100 days; four new filter-beds; and a 10-inch water-main. The new reservoir is 300 feet above sea-level; and it is 40 feet deep. The increased supply is now available; the old and the new mains having been connected a fortnight ago. The total cost of the work has been about £11,500.

The Dundee Town Council, in the capacity of Water Commissioners, met yesterday to consider the estimates for the current year. These provide for an expenditure of £49,381, of which the principal items are: Deficit from last year £186, annuities £14,315, interest £17,250, sinking fund £6680, maintenance and management £6450, and taxes £4500. A domestic rate of 9d. per pound is estimated to yield £16,455; while the public rate, at 1d. per pound, and special rates are put down as likely to bring in £33,575—a total of £50,030. The sum of £700 is estimated as being irrecoverable, and falls to be deducted; making the total from the rates £49,330. Rents are expected to give £125; and the income is therefore estimated at £49,455, bringing out a surplus of £73. The estimates were adopted by the Council, and it was agreed that the domestic rate be 9d. per pound and the public rate 1d. per pound—the same as before. Last year the revenue was £49,163, and the expenditure £49,349.

*An account of the visit will be found on p. 43.—Ed. J.G.L.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June 29.*

**Sulphate of Ammonia**.—There has been more doing in Scotland; and all second-hand parcels offering there have been removed. At other points, the market has been quiet, though prices have been about maintained. The closing quotations are £10 5s. per ton f.o.b. Hull, and £10 10s. to £10 11s. 3d. per ton f.o.b. Liverpool and Leith. The interest of buyers has been centred mainly upon the forward position; but the firmness of makers has been a bar to any large business. London (Beckton terms) is quoted £10 15s. per ton, delivery up to the end of the year. For July-December, £10 17s. 6d. per ton, ordinary terms, is required f.o.b. Leith, and £11 for October-March. £11 per ton is reported for January-June, 1902, and £11 2s. 6d. now asked.

**Nitrate of Soda** is steady at 8s. 9d. to 9s. per cwt., according to quality, on spot.

LONDON, *June 29.*

**Tar Products.**—The markets generally remain quiet; and there is not much doing. But business is very brisk in pitch, especially as regards London. Beckton reports sales at 31s. per ton, and now asks 32s. In the North also, the demand has improved, probably owing to the large orders which have been placed for forward delivery. Tar oils are in fairly good demand, and prices show a slight advance. Carbolic acid continues very dull indeed. Business is reported in crude at 2s. 3d. per gallon, July-December; but consumers are not at all anxious to purchase, as the demand for crystals is quiet. Sales of German crystals are reported at very low prices; and this has a bad effect on the raw material. Crude naphthalene is quiet. A few transactions have taken place, but at low prices, doubtless owing to the difficulties attending shipments during hot weather. Benzol is very dull; and there is a considerable depression in 90 per cent. for prompt delivery. Sales are reported at 8¾d. to 9d. London, July shipment, while in the Provinces even lower prices have been accepted. Solvent remains dull, and without interest. The prices of anthracene are purely nominal; and there is no business to report.

The average values obtaining during the week are: Tar, 14s. 6d. to 17s. 6d. Pitch, east coast, 30s. to 30s 6d; west coast, 28s. to 28s. 6d. Benzol, 90's, 8d. to 9d.; 50's, 8½d. to 9d. Toluol, 11d. Crude naphtha, 4d. Solvent naphtha, 1s. to 1s. 1d. Heavy naphtha, 11d. to 1s.; Creosote 1⅞d. to 1⅝d. Heavy oils, 2¼d. Carbolic acid, 60's, 2s. 3d.

Naphthalene, 65s. to 80s.; salts, 37s. 6d. to 45s. Anthracene, "A," 40-45 per cent., 2½d.; "B," 2d. (nominal).

**Sulphate of Ammonia.**—During the week prices have remained stationary; but towards the close a better feeling has prevailed. Although the Gaslight and Coke Company still quote £10 15s., dealers are offering second-hand parcels at considerably under this; but there are not wanting signs that the demand may improve in July. In Hull, a few small sales have been made at £10 6s. 3d., prompt delivery; but these were only for good makes. In Leith business is reported at £10 10s—the full market value. Some small sales have been made for shipment at Liverpool at prices ruling for the last eight or ten days.

## COAL TRADE REPORTS.

**Lancashire Coal Trade.**—As prices leak out in connection with some contracts placed here and there, they afford evidence that much greater concessions have been made than colliery proprietors are prepared to admit, or than were thought at all probable only a few months back. On gas coal contracts, a reduction of 3s. per ton has become pretty general; and a comparison of the prices that in some instances were obtained last year with those now being accepted, shows a difference of something like 3s. 6d. to 4s. per ton. So far as the general bases of prices can be gathered, they represent about 10s. to 10s. 3d. per ton at the pit for common, 10s. 6d. to 10s. 9d. for medium, up to about 11s. and 11s. 3d. for the best qualities of screened gas coal. As against these rates, the average figures last year were about 13s. 6d. to 14s. per ton for medium, and 14s. 6d. to 15s. for best gas coals. In the Derbyshire district, there are negotiations now going on for some of the locomotive fuel contracts, of which the railway companies have so far placed only comparatively small quantities in Lancashire; and the figures that have been quoted range from about 8s. 6d. to 9s. per ton at the pit. In the lower qualities of round coal, for steam and forge purposes, contracts are also being taken at very low figures—representing about 9s. per ton at the pit, with cuts even below this, where competition has to be encountered. This compares with about 12s. 6d. to 13s. per ton as the maximum figures last year. In engine classes of fuel, some very low prices have been taken in outside districts—quite 5s. per ton under those that were secured last year; while for Lancashire slack 6s. 6d. to 7s. per ton are about the ordinary quoted rates for common, up to 8s. and 8s. 6d. for the best qualities, with, however, prices having to be cut on these figures against lower rates quoted to customers from other districts. The shipping trade remains quiet; and prices are steadily receding. Ordinary steam coal, delivered at the Mersey ports, is obtainable at about 11s. to 11s. 3d. per ton; and contracts are reported to have been placed at as low as 10s. 6d. Coke remains firm at recent quotations, averaging 12s. 6d. to 13s. 6d. per ton at the ovens for good washed Lancashire furnace cokes, and 24s. to 26s. for good foundry sorts.

**Northern Coal Trade.**—There has been a much lessened production of coal on Tyneside, through the local holidays of the last few days; and hence there is some scarcity, which has stiffened prices for prompt delivery, though it has not affected the quotations for forward contracts. Best Northumbrian steam coals are steady at from 13s. per ton f.o.b.; and steam smalls are from 5s. to 5s. 6d. The collieries have now full work ahead for some weeks; and there will probably be a large output. In the gas coal trade, the demand is very strong for occasional and additional cargoes; and the price for best qualities of Durham gas coals is now as high as from 10s. 6d. to 10s. 9d. per ton f.o.b. Some local contracts continue to be booked; and these are on the basis of the prices of the larger ones concluded a little time ago—about equal to 9s. per ton f.o.b. on the average. The coke trade is brisk—exports being fully equal to the quantity usually sent at this time of the year; and the price is from 17s. 6d. to 18s. per ton f.o.b. Gas coke is steady, without much variation in the quotations.

**Scotch Coal Trade.**—Trade is still in an indecisive condition. That there is expectation of a further reduction in price, is shown by the general indisposition to contract forward. Foreign trade appears to have benefited to some extent by the reduction which has taken place; but the tax has come in at an inopportune time for the summer exports, and has checked them. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. to 11s., and splint 10s. to 10s. 3d. The shipments for the week amounted to 225,117 tons—an increase of 7014 tons upon the previous week, but a decrease of 34,767 tons upon the corresponding week of last year. For the year to date, the total exports have been 4,382,599 tons—a decrease of 611,397 tons upon the same period of last year.

**German Gas-Tubes for Birmingham.**—The trouble in the German tube-trade, where the Syndicate are engaged in fighting an outside group of manufacturers, has entirely disorganized business in that country on home account, with the result, says the "Ironmonger," that the German tube makers are paying increased attention to foreign markets, where, if prices are no better, the orders obtainable at any rate promise more continuous employment than do those placed by domestic consumers. Birmingham, of all cities in the world, is understood to have supplied her requirements for the current year with gas-tube which will be made in Germany. A short time ago it was reported in the Daily Press, with a great flourish of trumpets, that "the foreign tube makers had been defeated at their own game," and that "the contract for the supply of gas-tube to the Birmingham Corporation had been secured by British makers—the Americans having been hopelessly beaten. As some such story appears to be in process of revival just now, it may be as well for us to try to lay the ghost of misinformation which is abroad, and to state definitely that the gas-tubes to be supplied to the Birmingham Corporation are not of British, but of German, make, although they are being supplied through the Birmingham agents of a British tube-works. It seems a little remarkable, on the face of it, that, situated as they are in the very home of the tube industry, the Birmingham authorities should have decided to supply their requirements with tube of German manufacture."

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

**Referred to on p. 21.**

| Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | GAS COMPANIES. | | | £ s. d. |
| 590,000 | 10 | Apl. 12 | 10½ | Alliance & Dublin 10 p.c. | 18½—19½ | −½ | 5 7 8 |
| 100,000 | 10 | ,, | 7½ | Do. 7 p.c. | 13—14 | .. | 5 7 2 |
| 300,000 | 100 | Jan. 2 | 5 | Australian 5 p.c. Deb. | 102—104 | .. | 4 16 2 |
| 200,000 | 5 | May 15 | 6½ | Bombay, Ltd. | 6—6½ | .. | 5 0 0 |
| 40,000 | 5 | ,, | 6½ | Do. New, £4 paid | 4½—4¾ | .. | 5 9 5 |
| 380,000 | Stk. | Feb. 14 | 12 | Brentford Consolidated | 260—265 | .. | 4 10 7 |
| 270,000 | ,, | ,, | 9 | Do. New | 190—195 | .. | 4 12 4 |
| 50,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 128—132 | .. | 3 15 9 |
| 159,375 | ,, | June 14 | 4 | Do. 4 p.c. Deb. | 111—114 | .. | 3 10 2 |
| 220,000 | Stk. | Mar. 14 | 10 | Brighton & Hove Orig. | 222—227 | .. | 4 8 1 |
| 226,320 | ,, | ,, | 7 | Do. A. Ord. Stk. | 155—160 | .. | 4 7 6 |
| 1,022,500 | Stk. | Feb. 27 | 5 | Bristol, 5 p.c. max. | 121—123 | .. | 4 1 4 |
| 420,000 | 20 | Mar. 28 | 10 | British | 41—42 | .. | 4 15 3 |
| 50,000 | 10 | Feb. 28 | 12 | Bromley, Ord. 10 p.c. | 24—26 | .. | 4 12 4 |
| 79,000 | 10 | ,, | 9 | Do. 7 p.c. | 19—21 | .. | 4 5 8 |
| 500,000 | 10 | May 31 | 6 | Buenos Ayres (New) Ltd. | 8½—9½ | .. | 6 6 4 |
| 220,000 | Stk. | June 28 | 4 | Do. 4 p.c. Deb. | 94—97* | +1 | 4 2 6 |
| 150,000 | 20 | Mar. 14 | 8½ | Cagliari, Ltd. | 22—24 | .. | 6 17 6 |
| 100,000 | 10 | May 31 | 10 | Cape Town & Dis., Ltd. | 14½—15½ | .. | 6 9 0 |
| 50,000 | 50 | May 2 | 6 | Do. 6 p.c. 1st Mort. | 51—53 | .. | 5 13 2 |
| 550,000 | Stk. | Apl. 12 | 12 | Commercial Old Stock | 270—280 | .. | 4 5 9 |
| 236,425 | ,, | ,, | 9 | Do. New do. | 205—210 | .. | 4 5 9 |
| 238,237 | ,, | June 14 | 4½ | Do. 4½ p.c. Deb. | 125—130 | .. | 3 9 3 |
| 800,000 | Stk. | May 31 | 9 | Continental Union, Ltd. | 160—165 | .. | 5 9 1 |
| 200,000 | ,, | ,, | 7 | Do. 7 p.c. Pref. | 160—165 | .. | 4 4 10 |
| 575,000 | Stk. | Feb. 28 | 5 | Crystal Palace Ord. 5 p.c. | 120—125 | .. | 4 0 0 |
| 60,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 125—130 | .. | 3 16 11 |
| 486,090 | 10 | Jan. 31 | 11 | European, Ltd. | 19½—20½ | .. | 5 7 3 |
| 354,060 | 10 | ,, | 11 | Do. £7 10s. paid | 14½—15½ | .. | 5 6 5 |
| 15,079,885 | Stk. | Feb. 14 | 4 5/16 | Gas-light and Coke | 4 p.c. Ord. | .. | 4 10 9 |
| 2,600,000 | ,, | ,, | 3½ | | 3½ p.c. max. | .. | 3 16 1 |
| 3,799,735 | ,, | ,, | 4 | | 4 p.c. Con. Pref. | .. | 3 12 1 |
| 4,063,425 | ,, | June 14 | 3 | | 3 p.c. Con. Deb. | .. | 3 3 10 |
| 70,000 | 10 | May 31 | 8 | Hongkong & China, Ltd. | 13—14 | .. | 5 14 4 |
| 3,800,000 | Stk. | May 15 | 10 | Imperial Continental | 208—212 | .. | 4 14 4 |
| 473,600 | Stk. | Feb. 14 | 3½ | Do. 3½ p.c. Deb. Red. | 100—102 | .. | 3 8 8 |
| 561,000 | Stk. | Feb. 28 | 10 | Liverpool United A | 234—236 | .. | 4 4 9 |
| 678,100 | ,, | ,, | 7 | Do. do. B | 172—176 | .. | 3 19 7 |
| 306,083 | ,, | Dec. 28 | 4 | Do. do. Deb. Stk. | 120—122 | .. | 3 5 7 |
| 75,000 | 5 | June 14 | 4 | Malta & Medn., Ltd. | 4½—5 | .. | 4 0 0 |
| 560,000 | 100 | Apl. 1 | 5 | Met. of | 5 p.c. Deb. | .. | 4 12 7 |
| 250,000 | 100 | ,, | 4½ | Melbourne | 4½ p.c. Deb. | +1 | 4 5 9 |
| 541,920 | 20 | May 31 | 3½ | Monte Video, Ltd. | 9—10 | .. | 7 0 0 |
| 717,946 | Stk. | Feb. 22 | 8½ | Newc'tle & G'tesh'd Con. | 230—231 | .. | 3 13 7 |
| 312,855 | Stk. | Dec. 28 | 3½ | Do. 3½ p.c. Deb. | 99—101 | .. | 3 9 4 |
| 150,000 | 5 | May 15 | 8 | Oriental, Ltd. | 6¾—7¼ | .. | 5 10 4 |
| 135,900 | 5 | ,, | 8 | Do. New, £4 10s. pd. | 6—6¼ | .. | 5 10 10 |
| 15,000 | 5 | ,, | 8 | Do. do. 1879, £1 pd. | 1¼—1½ | .. | 4 11 5 |
| | | | | | *Ex. div. | | |

| Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | GAS COMPANIES. | | | £ s. d. |
| 60,000 | 5 | Feb. 28 | 7 | Ottoman, Ltd. | 5⅜—6¼ | .. | 5 12 0 |
| 851,070 | 10 | Apl. 26 | 7 | River Plate Ord. | 10¾—11½ | .. | 6 4 5 |
| 250,000 | Stk. | June 28 | 4 | Do. 4 p.c. Deb. | 97—99* | +1 | 4 0 10 |
| 250,000 | 10 | Mar. 28 | 8 | San Paulo, Ltd. | 10⅝—11⅛ | .. | 6 19 1 |
| 135,000 | Stk. | Mar. 14 | 10 | Sheffield A | 235—240 | .. | 4 3 4 |
| 209,984 | ,, | ,, | 10 | Do. B | 234—236 | .. | 4 4 9 |
| 523,498 | ,, | ,, | 10 | Do. C | 232—234 | .. | 4 5 6 |
| 5,761,885 | Stk. | Feb. 14 | 5 | South Met., 4 p.c. Ord. | 124—127 | .. | 3 18 8 |
| 1,547,965 | ,, | Jan. 16 | 3 | Do. 3 p.c. Deb. | 93—96 | .. | 3 2 6 |
| 380,940 | Stk. | May 15 | 5 | Southampton Ord. | 106—111 | .. | 4 10 1 |
| 70,825 | ,, | Jan. 16 | 4 | Do. 4 p.c. Deb. | 105—110 | .. | 3 12 9 |
| 120,000 | Stk. | Feb. 28 | 6 | Tottenham and Edmonton | A. 5 p.c. | 115—120 | .. 5 0 0 |
| 250,520 | ,, | ,, | 4½ | | B. 3½ p.c. | 85—90 | .. 5 0 0 |
| 182,380 | 10 | Jan. 16 | 5 | Tuscan, Ltd. | | 8—9 | .. 5 11 1 |
| 149,900 | 10 | Jan. 2 | 5 | Do. 5 p.c. Deb. Red. | | 97—102 | .. 4 18 0 |
| 230,000 | 5 | Feb. 28 | 9 | West Ham, 10 p.c. | | 9—10 | .. 4 10 0 |
| 147,000 | 10 | ,, | 6 | Do. 7 p.c. | | 11¼—12½ | .. 4 16 0 |
| 128,984 | Stk. | June 28 | 4 | Do. 4 p.c. Deb. | | 103—108* | .. 3 14 1 |
| | | | | WATER COMPANIES. | | | |
| 780,599 | Stk. | June 28 | 11 | Chelsea, Ord. | | 285—290* | .. 3 15 10 |
| 150,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | | 153—158* | .. 3 3 3 |
| 160,000 | ,, | ,, | 4½ | Do. 4½ p.c. Pref. '75 | | 137—140* | .. 3 4 4 |
| 175,785 | ,, | Mar. 28 | 4½ | Do. 4½ p.c. Deb. | | 140—145 | .. 3 2 1 |
| 1,720,560 | Stk. | Apl. 12 | 7 | East London, Ord. | | 188—193 | .. 3 12 6 |
| 654,740 | ,, | June 14 | 4½ | Do. 4½ p.c. Deb. | | 143—148 | .. 3 0 10 |
| 980,169 | ,, | ,, | 3 | Do. 3 p.c. Deb. | | 94—96 | .. 3 2 6 |
| 700,000 | 50 | June 14 | 8 | Grand Junction | 10 p.c. max. | 103—106 | .. 3 15 6 |
| 310,000 | Stk. | Mar. 28 | 4 | | 4 p.c. Deb. | 123—127 | .. 3 3 0 |
| 708,000 | Stk. | Feb. 14 | 14 | Kent | | 285—295 | .. 4 14 11 |
| 160,000 | ,, | ,, | 7 | Do. New, 7 p.c. max. | | 200—205 | .. 3 8 4 |
| 1,043,800 | 100 | June 28 | 10½ | Lambeth, 10 p.c. max. | | 265—275* | .. 3 16 4 |
| 406,200 | 100 | ,, | 8 | Do. 7½ p.c. max. | | 200—205* | −1¼ 3 18 1 |
| 350,000 | Stk. | Mar. 28 | 4 | Do. 4 p.c. Deb. | | 123—126 | .. 3 3 6 |
| 500,000 | 100 | Feb. 14 | 13¾ | New River, New Shares | | 400—405 | −3 3 7 11 |
| 1,000,000 | Stk. | Jan. 31 | 4 | Do. 4 p.c. Deb. | | 127—132 | .. 3 0 7 |
| 902,300 | Stk. | June 14 | 6 | South-wark and Vauxhall | Ord. | 172—177 | .. 3 7 9 |
| 126,500 | 100 | ,, | 6 | | 7½ p.c. max. | 162—167 | .. 3 11 10 |
| 489,200 | Stk. | ,, | 5 | | 5 p.c. Pref. | 150—155 | .. 3 4 6 |
| 1,019,585 | ,, | Apl. 12 | 4 | | 4 p.c. A Deb. | 125—130 | .. 3 1 7 |
| 1,155,066 | Stk. | June 14 | 10 | West Middlesex | | 260—265 | .. 3 15 6 |
| 200,000 | ,, | ,, | 4½ | Do. 4½ p.c. Deb. | | 138—143 | .. 3 2 11 |
| 200,000 | ,, | Mar. 14 | 3 | Do. 3 p.c. Deb. | | 95—98 | .. 3 1 3 |
| | | | | | | *Ex. div. | |

**London County Council and the Subways.**—At the meeting of the London County Council on Tuesday, the recommendation of the Improvements Committee, referred to last week, to the effect that a clause or clauses should be inserted in the Bill authorizing the annual list of county improvements to provide that the London County Council (Subways) Act, 1893, should be so extended as to apply to any subway or subways constructed by the Council in connection with the proposed improvements, was adopted.

**Water Rights on Burley Moor.**—Mr. T. Taylor Wainwright, of Liverpool, the Umpire in the arbitration with respect to the value of the water rights on Burley Moor, belonging to Mrs. Crofton (Lady of the Manor), which the Burley-in-Wharfedale Urban District Council have obtained parliamentary power to acquire, has issued his award. The valuation put on the undertaking by Mrs. Crofton's advisers was £10,602; and that by the experts for the District Council, ranged from £874 to £885. The award is for £4651.

**Wokingham Gas-Works Extensions.**—Mr. R. H. Bicknell, M.Inst. C.E., recently held an inquiry, on behalf of the Local Government Board, with reference to the application by the Wokingham Town Council for sanction to the borrowing of £2500 for gas-works purposes. The Town Clerk (Mr. J. May) stated that the population of the borough at the last census was 3551—an increase of 297 over that of 1891; and its assessable value was £15,648. The total amount already borrowed for gas-works purposes was £10,944, and £2000 for sewerage, of which a considerable sum had been repaid. With regard to the present loan, the new holder, which had a capacity of 160,000 cubic feet, came into use on Dec. 21 last. Prior to, as well as since, that date, applications for new supplies had been received; and the consumption of gas was rapidly increasing, owing to the erection of many new houses, and the formation of new roads. The Gas Committee, with a view to still further increasing the consumption, held an exhibition of gas cooking-stoves and other appliances, slot meters, &c., in March last; and the result had been very successful in obtaining additional consumers, This would very considerably increase the quantity of gas consumed during the summer months. Having read the formal resolutions upon the subject passed by the Council, the Town Clerk read the items for the proposed loan, as follows: Extra cost overspent in connection with new holder and tank (owing to increase in price of iron, &c.), £980; estimate for new mains, £640; slot meters and stoves, £560; new governors, connections, and fitting up new offices, £100; photometer and fitting up, £90; gas-engine, &c., £100; estimated cost of new loan, £30—total, £2500. The Mayor (Mr. E. C. Hughes) explained that much of the overspent capital of £980 was due to the fact that, after a previous sum had been borrowed, it was found that they wanted a larger holder, and consequently more ground. The Gas Manager (Mr. A. G. Bates) and the Surveyor (Mr. J. Manley) produced plans of the proposed new works. After receiving information as to the several items in the application, the Inspector proceeded to the gas-works with the Mayor to examine the site, &c. There was no opposition to the application.

**Extensions at the Malvern Gas-Works.**—Mr. E. A. Sandford Fawcett, Local Government Board Inspector, held an inquiry at Malvern last Wednesday in regard to an application by the Malvern Urban District Council for loans for carrying out various improvements, including £13,000 for extensions at Malvern Link Gas-Works and £5000 for gas cookers and slot meters.

**Cleckheaton Gas Supply.**—The annual report of the Cleckheaton Gas Committee, as prepared for the District Council, shows a gross profit for the past year of £2397, compared with £3482 in the preceding year. The average cost of coal during the year was 4s. per ton higher than in the year before. This added £1700 to the working expenses; but no advance was made in the price of gas. The amount of capital employed is £32,200. Adding £600 for the cost of gas supplied to the public lamps, the gross profit was equal to 9·31 per cent., as against 11·65 per cent. the previous year.

**Trades Councillors Visit the Leicester Gas-Works.**—Last Saturday week, about 70 members of the Local Trades Council visited the Leicester Gas-Works at the invitation of the Mayor (Alderman Lennard), who conducted the party over the more interesting departments. Subsequently the delegates were entertained to tea in the recreation-room, and the Mayor gave an address on the difficulties in the way of England maintaining her commercial supremacy. He had, he said, great faith in the British workman; and he believed that if masters and men discussed their differences in an amicable way without resorting to strikes, they would continue to hold their own throughout the world. But if they did not, he believed they would be beaten, and beaten badly. It was for those whom he was addressing, who were the leaders of the working men, and who formed the "parliament of labour" in the town, to take a wider outlook as to their duties and responsibilities.

**Cheap Gas for Motive Power at Derby.**—An important announcement has just been made by the Derby Gas Company. In order to further extend and encourage the use of gas for purposes of motive power, the Directors have decided to reduce their charge for gas used for engines or motors to a uniform rate of 2s. 3d. per 1000 cubic feet as from the 30th ult. They estimate that coal gas of the high calorific value of that supplied by the Company, when used in modern high-class gas-engines, will, at the reduced price, be equal to electricity at about ½d. per unit. With the view of placing this cheap form of motive power within the reach of small users, of which there must be many in such an industrial centre as Derby, the Directors are prepared to supply and fix gas-engines for all purposes upon advantageous terms for cash, or upon deferred payments extending over three, four, or five years; and the assistance of their Engineer (Mr. J. Ferguson Bell) will be available for any firm who may require additional power, or who contemplate alterations. The Directors hope these concessions will be the means of greatly extending the use of gas for industrial purposes; the present reduction in price making it an exceptionally cheap source of motive power. The liberal policy they have inaugurated should meet with appreciative acknowledgment, which would encourage them to further extend it.

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**Brigg Gas Supply.**—The Brigg Gas-Works have now been under the management of the Urban District Council for over twelve months; and the balance-sheet for the year shows that the total receipts amounted to £3583 and the expenditure to £2546, giving a profit on the year's working of £1037.

**High-Pressure Incandescent Gas Lighting for Thames Bridges.**—At the meeting of the Court of Common Council of the City of London on Thursday week, a recommendation sanctioning a contract with the South Metropolitan Gas Company to light Southwark, Blackfriars, and the Tower Bridges by the high-pressure incandescent gas system was agreed to.

**Gas Poisoning Through a Defective Tap.**—An inquest was held at Plymouth yesterday week on the body of Laura Miall, aged 80, widow of a Customs officer, who died that day from the effects of gas poisoning. The deceased, who was on a visit to Plymouth, was found unconscious on the previous Saturday morning, while her room was full of gas which was escaping from a burner. There was no stop to the tap, and it was presumed that, in turning out the light when she went to bed on the previous Friday night, she twisted the tap round, and thus turned it on again. She was medically attended, but remained unconscious until her death. The Jury suggested that the Gas Company should examine the taps; but the Coroner said the Company had no authority to enter houses for this purpose. A verdict of "Accidental death" was returned.

**The Cork Strike.**—A deputation from the Public Works Committee of the Cork Corporation recently waited upon the Directors of the Gas Company with the view of assisting, if possible, in bringing about an amicable settlement of the difference existing between them and the men on strike, and in thus putting an end to the public inconvenience arising from the defective lighting of the city caused thereby. The report of the deputation was presented to the Committee at their meeting last week. In the course of it they stated that, without entering into the difference in question, they represented the strong desire of the Corporation that some way might be found out of the present unhappy situation, which tended to keep alive a feeling of irritation between employers and workmen, and also entailed more or less loss and suffering upon the latter and their families or friends. The Chairman, on behalf of the Directors, assured the deputation that they were fully alive to their obligations to provide the citizens with adequate light, and that they had spared no effort to restore the service (which had been dislocated by the action of the men) to its normal efficiency; but he claimed for the Company the reasonable consideration which every such body received when its operations were put out of gear by such events as strikes. As regarded the men, he observed that the Directors were bound, in justice to those who had come to their aid, and helped them to save the city from darkness, to continue them in their service; while as to those on strike, as a matter of fact none of them had applied for re-employment. It was decided to forward the report to the Town Council. The Police Court proceedings arising out of the strike have again been adjourned.

**Carburetted Water-Gas Plant for Carlisle.**—A meeting of the Gas Committee of the Carlisle Corporation was held last week, at which tenders in connection with the proposed installation of carburetted water gas were considered, with the observations thereon of Messrs. Corbet Woodall and Son, who are advising the Committee, which were read by the Town Clerk. It was agreed that the following tenders (among others) should be accepted: Purifiers, Messrs. C. & W. Walker; exhausters and engines, Messrs. G. Waller and Co.; meters, Messrs. Parkinson and Cowan.

**Middleton Gas Supply.**—At the last monthly meeting of the Middleton Town Council, the report of the Gas Engineer (Mr. Tim Duxbury) for the year ending the 31st of March set forth that the extra quantity of gas sold was 5,012,000 cubic feet, or 4·66 per cent.; and that the make had increased by 4,387,000 cubic feet, although the fuel carbonized was upwards of 1000 tons less. Hence the make of gas per ton of fuel carbonized was 1241 feet more than before—or a saving of 1480 tons of coal and cannel. It was explained that the results were mainly due, among other causes, to certain coals contracted for being much better in quality than those usually purchased. The coke sold was 695 tons more, due chiefly to economy on the works. The coal and cannel entailed an expenditure of £9278, compared with £7527 in the previous year and £5579 in 1898-9. This amount would have been considerably more but for the improved working results obtained in the retort-house. The gross revenue for the year amounted to £22,067, and the gross expenditure, less annuities, interest, and sinking fund, to £15,322—leaving a gross profit of £6745, against £7218, or a decrease of £473. The net profit was £1252, against £1970—a decrease of £718, due to the increased cost of coal.

**Penarth Water Supply.**—Alderman Jones recently presided over a meeting of the Water Committee of the Cardiff Corporation, when a full report was presented by the Engineer (Mr. C. H. Priestley) on the proposed schemes for providing the Penarth higher level district with an adequate supply of water. He said he had prepared an estimate of the cost of the pumping extensions proposed at Cogan, and of the alternative gravitation scheme from Rhubina to Leckwith. The cost of the gravitation scheme would be £20,539 with pipes at £5 per ton, and £21,567 with pipes at £5 10s. per ton; while the annual cost for interest and sinking-fund charges on the first estimate would, at thirty years' purchase, be £1286, and on the latter estimate £1347, including all working expenses. The total cost of the extension of the pumping plant at Cogan would be £2480; and the interest and sinking-fund charges on this, at ten years' purchase, and including working expenses, would be £782 per annum. The Committee recommended the Council to adopt the extension of the pumping plant, as against the gravitation main, and to ask the Town Clerk to make application for borrowing £7304 for the new reservoir at Leckwith, to have a storage capacity of 2 million gallons, against 600,000 gallons at the present reservoir, and £4309 for the main from the pumping-station to Leckwith. It was also agreed to accept the tender of Messrs. Simpson and Co., Limited, for a triple-expansion Worthington pumping-engine at £2180.


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**New Joint-Stock Companies.**—The Denbigh Gas and Coke Company, Limited, has been registered with a capital of £10,000, in 500 shares of £6 each and 1400 shares of £5 each, to take over as a going concern the business of the Denbigh Gas and Coke Company, Limited, constituted by Deed of Settlement dated March 18, 1847. The Dickson Mantle Syndicate, Limited, has been formed with a capital of £40,000, in £1 shares, to adopt an agreement with W. K. L. Dickson, and (*inter alia*) to apply for, or obtain patents and rights relating to, inventions connected with gas lighting and electricity, or otherwise. The Hiram Maxim Lamp Company, Limited, has been registered with a capital of £70,000, in £1 shares, to adopt an agreement with C. M. Downie to carry on the business of electricians, mechanical engineers, producers and suppliers of electricity for the purposes of light, heat, or power, and manufacturers of, and dealers in, all apparatus and things capable of being used in connection with the generation, distribution, accumulation, and employment of electricity.

**Earl Grey on Profit-Sharing.**—"Profit-sharing in Industry" formed the topic for discussion at the recent monthly debate of the Article Club, when Earl Grey declared his belief that in co-partnership in industrial enterprise lay the real security for the prosperity of British commerce. It had lately been realized that unless they could Americanize their industries and impart into them—both to the directors and to the people of the workshop—the same alertness, go, and vigour which they found on the other side of the Atlantic, they ran the risk of being left high and dry on the mud when the ebb to the tide of prosperity set in. Profit-sharing was regarded as chiefly useful in giving the workers an interest in their particular industry over and above the wage which was at present the only relation between the worker and the employer. None of the existing methods for prosperity-sharing adopted by some firms touched the root of the real evil they had to face. They had to consolidate two separate camps, the army of the employers and that of the workers—the employers trying to get as much out of the workers at as low a wage as possible, and the workers endeavouring to do as little as they could for the wage they received. The present condition of industrial enterprise was such as to make men believe that it was their duty towards their fellow-workers so to regulate their labour and output as to make it necessary for their employers to engage three men where two would be sufficient. That was the "lump of labour" theory. He believed that Englishmen would go one better than Americans if they applied the principle of co-partnership to their industry. It would mean higher wages, bigger dividends, and greater security between labour and capital. After referring to the profit-sharing principle as adopted at the Thames Iron-Works, by the firm of Messrs. Clarke, Nichols, and Coombes, and by the South Metropolitan Gas Company, Earl Grey said they were going to have bad times in the future unless they could knock out the pestilential and fallacious belief that it was the interest of every man employed to have regard to the unemployed instead of having regard to his employer. The way to succeed was to apply co-partnership principles, which were absolutely fair, and did not rob anyone; and he thought that, where tried, these principles were sure to be found a never-ceasing cause of satisfaction.

**Birmingham Welsh Water Scheme.**—It is the intention of the Birmingham Corporation to promote a Bill in the next session of Parliament in which several important powers will be sought. One of them will be to secure an extension of time for the completion of the Welsh water scheme, and possibly to modify the financial arrangements connected with it. According to the Water Act, the scheme should be completed in 1902. But there is a good deal of heavy pipe-laying to be done; and it is not considered possible to get the work finished until the autumn of 1903 at the earliest.

**Westbury (Wilts.) Water-Works.**—It appears that the new waterworks for Westbury are proving more costly than was at first anticipated. When the scheme was started £8000 was fixed as the cost; but unforeseen difficulties and fluctuations in the market made it necessary to apply for a further loan of £5000, which was sanctioned by the Local Government Board. The total outlay up to the present time has been £13,483; and the Engineer of the works has been deputed to make a special journey to London with a view to obtaining sanction for another loan of £1000.

**Gas Question in Paris.**—It may be remembered that the outcome of the long discussions on the above subject which took place in the Paris Municipal Council at the close of the past, and the commencement of the present, year was the reference of the question to the First Committee, under the presidency of M. Alpy. We now learn that, as a result of their deliberations, the Committee do not favour either an extension of the present Company's concession or a strictly municipal gas supply. The Council are advised to provide works and plant equal to the production of 8 million cubic feet of gas per day, and then to lease them to a company operating under their supervision.

**The Surcharge on the Limerick Gas-Works Manager.**—As was recently intimated in the "JOURNAL," the Official Auditor of the Irish Local Government Board (Mr. Croker) surcharged the Manager of the Gas-Works, Mr. Riordan, with certain sums held to have been illegally paid to the bank as interest on overdrafts, while the Committee had money invested in securities. At the last meeting of the Gas Committee, the Mayor said they would have to continue receiving an overdraft for some time, as the Manager could not go on without it. It was not possible for a commercial firm as they were to carry on their business unless they received accommodation of the kind. It was therefore necessary that some arrangement should be made in order to protect the Manager; and if the matter was placed before the Local Government Board, they would probably find a way out of the difficulty. The Secretary (Mr. B. Baker) said the account fluctuated considerably. In July, 1900, the overdraft was £620; while three months later they had a credit balance of £565. In reply to the Mayor, the Manager said the former Auditor allowed an overdraft without surcharging. They had overdrawn to the extent of £180, and no surcharge was made. The Secretary said the interest on this sum was paid out of the interest on the credit account of the Committee, as Mr. Ellis, the former Auditor, held that interest on their money was no portion of the revenue, while Mr. Croker now held that it was. The further consideration of the matter was postponed.


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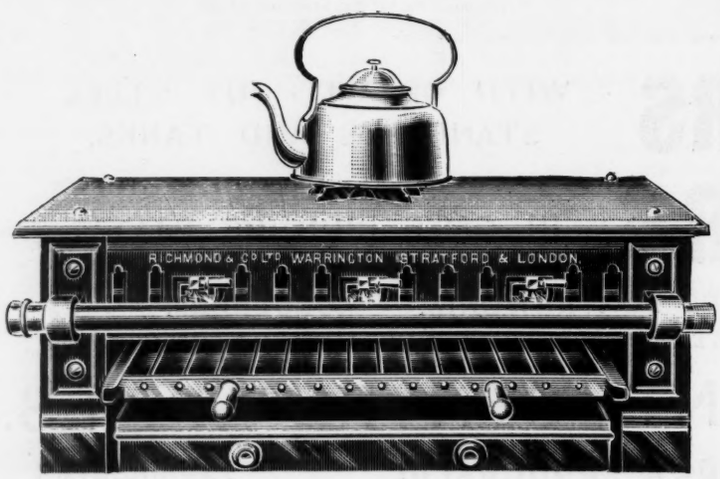


RICHMOND'S.

**Reductions in Price.**—The Walton-on-Thames and Weybridge Gas Company have reduced their price from 4s. 8d. for lighting and 4s. 6d. for heating and cooking purposes, to 4s. per 1000 cubic feet, as from the Midsummer quarter. The Shrewsbury Gas Company announce a reduction of 4d. per 1000 cubic feet in the price of gas, to take effect with the current quarter. The charge to consumers within the borough is now 3s. 2d., and to those beyond it 3s. 5d. The Guildford Gas Company have, as from yesterday, increased their discount from 2d. to 4d. per 1000 cubic feet. The Directors of the Newmarket Gas Company have reduced the price of gas 4d. per 1000 cubic feet to all consumers as from yesterday.

**Portsmouth Corporation and the Water Company.**—At a meeting of the Water Committee of the Portsmouth Corporation last Wednesday, the Chairman (Mr. H. R. Pink) presented the report of the Sub-Committee on the water-works purchase question, giving the details regarding its financial aspect; and it was unanimously resolved to send it to the Council for discussion at the next meeting. On that occasion, the Chairman intends to move a resolution to the effect that the Council should formally agree to the purchase of the undertaking on the following conditions: That the shareholders shall receive Corporation scrip to the full value of their holding; that the staff of the Company shall be taken over *en bloc* on Civil Service conditions; and that the Directors shall receive a sum equivalent to ten years' fees. If this resolution is carried, all that will remain to be done will be to obtain power from the ratepayers for the promotion of the necessary Bill, and to formally sign the agreement between the Corporation and the Company.

**Gas-Works Extensions at Ashton-in-Makerfield.**—An inquiry was held by Mr. W. A. Ducat, Local Government Board Inspector, at Ashton-in-Makerfield, last Tuesday, with regard to an application by the Council for permission to borrow £3000 for the purpose of their gas undertaking, and £270 for culverting the brook at the gas-works. The Clerk (Mr. A. Sykes) stated that no money had been expended out of capital on works for gas-producing purposes since 1896, when the small sum of £126 was spent. The make of gas in 1896 was 14,053,000 cubic feet; and there had been an increase of about 4,100,000 feet in six years. It was proposed to further supplement the existing number of public lamps by 61, and to lengthen by 2½ miles the line of mains, which at present extended 13½ miles. Owing to the continual but steady increased demand for gas, the Council found that the maximum consumption per day of 24 hours was upwards of 78,000 cubic feet; whereas the retorts were only capable of making from 80,000 to 90,000 cubic feet per day, which gave a very small margin. After evidence had been given, Mr. Sykes said that, as no portion of the proposed works had been started, the Council ventured to ask the Inspector to report favourably and early on the application, with a view to enable them to proceed with the works during the summer months, while the make of gas was not heavy, and the current of water passing along the stream was not strong. The Inspector remarked that he did not anticipate any objection to the application.

**Sale of Stock.**—Last Wednesday, Mr. Charles Stidolph offered for sale by public auction nearly £20,000 worth of stock of the Faversham Gas Company. The capital is required for the general extension of the Company's plant, the provision of prepayment meters, and general working expenses. The whole of the lots, which consisted of £13,120 worth of new ordinary stock and £6720 worth of 4 per cent. debenture stock, were sold. The former fetched from £107 to £103, and the the debenture stock from £103 5s. to £100, per £100 of stock.

**Rating Appeals in the Metropolis.**—At the sitting of the County of London Quarter Sessions, under the Valuation (Metropolis) Act, 1869, last Tuesday, the five appeals against the assessment of their property in various parts of London, which have been entered by the Grand Junction Water-Works Company, were referred to Mr. Ernest Page, K.C., as valuer. The assessment of a house or office of the Company in the parish of St. Marylebone was, by agreement, reduced from £542 to £459, rateable value. A similar order was made in the case of the East London Water Company, who have entered eleven appeals. In seven instances, the respondents assented to this course, and in four they offered objection on the ground of expense. Mr. Horace Avory, K.C., was appointed valuer.

**Downderry Water Supply.**—The St. Germans Rural District Council have received a Provisional Order from the Local Government Board, fixing the general scale of charges for the supply of water to houses in the contributory place of St. Germans which are without a proper supply. Where the rateable value of the house exceeds £4 6s. 8d., the charge is fixed at 10 per cent. per annum on the rateable value. The Board state that they have found a difficulty in framing the Order so as to give effect to the proposal to limit the scale to houses within the village of Downderry; and they have thought it best to make the Order apply to the whole contributory place. If, however, water is hereafter supplied to other villages, and it becomes necessary to reconsider the scale, the Board will be prepared to give attention to any application for the purpose.

**Improvements at the Torquay Water-Works.**—Last Tuesday, the members of the Torquay Town Council paid their annual visit to the water-works, which have lately undergone considerable changes, as the result of their anxiety to preserve the water from risk of contamination. Since the Corporation purchased the watershed, the whole of the houses upon it have been removed. All the streams have been fenced, their banks pitched, and the bends of the principal ones laid in cement. Trenches have also been made along both sides of the main streams to intercept any earth washed down from the hillsides by heavy rain. Alderman Bovey, the Chairman of the Water Committee, pointed out that for the natural filtration of the water before it enters the reservoirs strainers had been erected at the mouth of all the streams, and a large silting-pond has been formed at the higher end of the Kennick reservoir. As the result of all that has been done, he said they had an improved appearance of the water, and freedom from risk of contamination. The cost of purchasing the watershed amounted to £60,400, and the total outlay on the water undertaking was £250,000.


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| SWINDON (New Swindon Gas Co.) | 120,000 |
| SALTLEY, BIRMINGHAM (Second Contract) | 2,000,000 |
| WINDSOR ST., BIRMINGHAM (Second Cont.) | 2,000,000 |
| HALIFAX | 1,000,000 |
| TORONTO | 250,000 |
| OTTAWA | 250,000 |
| LINDSAY (Remodelled) | 125,000 |
| MONTREAL | 500,000 |
| TORONTO (Second Contract; Remodelled) | 2,000,000 |
| BELLEVILLE | 250,000 |
| OTTAWA (Second Contract) | 250,000 |
| BRANTFORD (Remodelled) | 200,000 |
| ST. CATHERINES (Remodelled) | 250,000 |
| KINGSTON, PA. | 125,000 |
| PETERBOROUGH, ONT. | 250,000 |
| WILKESBARRE, PA. | 750,000 |
| ST. CATHERINES (Second Contract) | 250,000 |
| BUFFALO, N.Y. | 2,000,000 |
| WINNIPEG, MAN. | 500,000 |
| COLCHESTER (Second Contract) | 300,000 |
| YORK | 750,000 |
| ROCHESTER | 500,000 |
| KINGSTON, ONT. | 300,000 |
| CRYSTAL PALACE DISTRICT | 2,000,000 |
| DULUTH, MINN. | 300,000 |
| CATERHAM | 150,000 |
| LEICESTER | 2,000,000 |
| ENSCHEDE (HOLLAND) | 150,000 |
| BUENOS AYRES (RIVER PLATE CO.) | 700,000 |
| BURNLEY | 1,500,000 |
| KINGSTON-ON-THAMES | 1,750,000 |
| ACCRINGTON | 500,000 |
| TONBRIDGE | 300,000 |
| STRETFORD | 500,000 |
| OLDBURY | 300,000 |
| TODMORDEN | 500,000 |
| SALTLEY, BIRMINGHAM (Third Contract) | 2,000,000 |
| YORK (Second Contract) | 750,000 |
| ROCHESTER (Second Contract) | 500,000 |
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**Complete Gas-Works at NELSON, BRITISH COLUMBIA.**

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**Coal Contracts of the Manchester Corporation.**—Mr. Alderman Gibson, Chairman of the Gas Committee of the Manchester Corporation, has communicated to the Press an announcement to the effect that contracts have been completed for the supply of 350,000 tons of coal at an average of 2s. 9d. per ton less than had to be paid last year; representing a saving to the Corporation of at least £50,000. This confirms the anticipations contained in previous reports from our Manchester correspondent; and also to some extent those which are current—that a concession of something like 3s. per ton is being made in some instances on inferior descriptions of gas coal.

**The Make of Gas at Neath.**—In the notice, in the "JOURNAL" for the 18th ult. (p. 1677), of the report presented by Mr. R. A. Browning, the Gas Engineer and Manager of the Neath Corporation, on the working of the undertaking in the past financial year, the statement that the make of gas had increased to 10,000 cubic feet per ton of coal did not adequately show the improved results obtained by Mr. Browning. Under the old system of carbonizing, he had to use large screened coal, and could only obtain the above-named quantity of gas per ton—the average being 9500 feet and under. By the new system he uses through coal unscreened, at a difference of 4s. per ton in the price; and last year he still kept up to the 10,000 cubic feet per ton.

**The Wages of Leeds Gas-Workers.**—At a meeting of the Gas Committee of the Leeds Corporation last Wednesday (Alderman Lowden presiding), the suggestions of a Sub-Committee who had been appointed to consider an application for increased wages from men employed at the various gas-works of the city were received and adopted. It was decided to communicate the suggestions to the men's representatives in order to ascertain their views before making any definite recommendation to the Council. The men concerned are the stokers of the horizontal retorts, the firemen, and coal wheelers. An adjourned meeting of workmen employed in various departments of the Corporation was held on Sunday, at the Kingston Unity Hall, for the purpose of considering the replies received from several Committees in regard to their rates of wages. There was a very large attendance. The meeting was addressed by Mr. J. E. Smith, District Secretary of the Gas Workers Union, who read the replies, which were, generally speaking, not considered satisfactory. It was decided to adjourn the meeting for a month; and, in the meantime, to ask the several Committees to give definite replies to the applications sent to them.

Messrs. H. Norman Brooke, Harold E. Cliff, and James Holroyd, who have been closely associated for a considerable period with the management of certain of the works of the Leeds Fire-Clay Company, have been elected Directors.

The freehold gas-works at Mitcheldean, Gloucestershire, have just been purchased by Mr. S. G. Tulk, of the Builth Wells Gas-Works.

The Barry Gas and Water Committee have decided to recommend the District Council to proceed with the erection of a new retort-house estimated to cost £10,000.

The Leeds Gas Committee, subject to the sanction of the City Council, have accepted the tender of Messrs. Clayton, Son, and Co., Limited, for the erection of a relief gasholder and oil storage tank in connection with the carburetted water-gas plant at the Meadow Lane works. The price is £4804. It is proposed that the cost be paid out of the reserve fund.

Messrs. Graham, Morton, and Co., Limited, of Leeds, have obtained a further contract for the whole of the coke elevating and conveying machinery and storage-tanks for the Shoreditch Station of the Gaslight and Coke Company; and also for two large coke-screening plants—one for delivering into trucks, and the other for delivering into barges—for the Saltley Gas-Works, Birmingham.

The Chemical Engineering Company have in hand orders for sulphate of ammonia plants, for both gas and chemical works, of a total capacity of upwards of 300,000 gallons of liquor per 24 hours. The rapid increase which has taken place in the business of the Company, of which Mr. Maurice Schwab is Manager, has necessitated more commodious premises; and the offices have just been removed from Gracechurch Street to 36, Mark Lane, E.C.

A very successful exhibition of gas-stoves has lately been held by the Davis Gas-Stove Company, Limited, in conjunction with the Ventnor Gas and Water Company, at the Friendly Societies' Hall, in that town. Lectures on high-class cookery were delivered by Miss M. E. Betts in the afternoon, and on household cookery in the evening; thus illustrating in a practical manner the many advantages of gas for culinary operations—not the least being its cheapness, the cost of the gas used at each lecture being only 1½d. Great interest was shown in the demonstrations, and good results have followed therefrom.

The extent and variety of the business undertaken by Messrs. Robert Dempster and Sons, Limited, of the Rose Mount Iron-Works, Elland, is effectively shown in the very handsome catalogue they are now issuing, of which a copy has been forwarded to us. The firm have had nearly half-a-century of existence, and have a well-established reputation. The new edition (the fifth) of their catalogue furnishes, in its 328 pages, abundant proof that they are well abreast of the times in the production of gas-works and other constructional ironwork; their large establishment at Elland having been specially built for this class of engineering.

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Apply, in first instance, by letter, stating Experience and Wages required, to Messrs. VALON, 140, Temple Chambers, LONDON, E.C. Steady employment for good Man.

**WANTED, One or Two thoroughly re**liable and steady Men as STOKERS. Must be good Shovel Chargers, and used to Engine and Exhauster.
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Apply, stating Age, Wages, and general Qualification, to

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Apply, by letter, giving Age, Experience, and Salary required, to No. 3711, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Salary to commence, £80 per annum.
Applicants must state Age, Qualification, and References, which must be sent not later than July 16, 1901, endorsed, "Application for Assistant Manager," and addressed to W. W. SANDBROOK, Esq., Chairman of the Woolton Gas Company, Woolton, near LIVERPOOL.

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**WANTED, Offers for Four Annular** CONDENSERS, with 8-inch Connections, 14 ft. 6 in. High. Inner Tubes 13 inch; Outer Tubes 21 inch, together with Overflow-Pipe and Seal-Pots.
Apply to G. MOAT, Gas-Works, Purston, PONTEFRACT.

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SINGLE GASHOLDER, 22 ft. by 10 ft. Four Columns
One PHOTOMETER by Sugg & Co., with 10-Candle Pentane Apparatus.
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**GAS PLANT for Sale—I can always offer** NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
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For Price and Particulars, apply to

JOHN ANDREWS.

Gas-Works, Langley Mill.

FOR SALE, VERY CHEAP.

**FIVE 21 in. by 15 in. Oval Self-Sealing** MOUTHPIECES, by Tangyes; also Two Wrought-Iron Lengths of HYDRAULIC MAIN, 9 ft. 6 in. by 18 in. by 18 in. ⊃ and 8 ft. 10 in. by 16 in. by 16 in. inside, suitable for Fives or Sixes, together with Valves, Dips, and Arch Pipes. The whole are in perfect condition, and may be seen on application to the undersigned.
Any portion of the above will be sold separately.

J. H. CORNISH,
Secretary and Manager.

Bridport Gas Company, Limited.

ABERTILLERY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

**OFFERS are required for Two Second-**Hand PURIFIERS with Lids, and two Four-Way Valves complete.
Purifiers are 6 feet square, and 4 feet in depth. Two of the Plates have been chipped at the angles in removal.

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One " 25 ft. by 10 ft., 6 "
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Erected complete. New Steel Tanks supplied.
Six Annular CONDENSERS, 30 feet high. Perfect.
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By order,
EDWARD LISTER,
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Gas Offices, Yeadon,
June 18, 1901.

KNARESBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

**THE Gas Committee of the above** Council invite TENDERS for the supply of about 1800 Tons of best screened GAS COAL, to be delivered at the Knaresborough Station during the Twelve Months following the 1st of August next, in such quantities as the Committee may require.
The Committee do not bind themselves to accept the lowest or any Tender.
They also invite TENDERS for the purchase of their surplus TAR and LIQUOR made during the same period.
Sealed and endorsed Tenders to be addressed to the undersigned on or before the 13th day of July next.

THOMAS MAINMAN,
Clerk to the Council.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

**THE Gas Committee of the above** Council invite TENDERS for the supply of 2400 Tons of clean, unscreened (through and through) first-class DURHAM or any other good GAS COAL, to be shipped in such quantities (by Sailing Vessels only) and at such times as may be required from the 30th day of June, 1901, for Twelve Months.
Tenders may be quoted either c.i.f. or f.o.b., and must be accompanied by a practical Working Analysis of the Coal.
Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Coal," to be sent to the undersigned not later than Tuesday, the 16th day of July.
The Committee reserve the right to accept the whole or any portion of the quantity required.

J. ALEX GRAY,
Gas Manager.

BANGOR (CO. DOWN) URBAN DISTRICT COUNCIL.

**THE above Council are prepared to re**ceive TENDERS for supplying and fixing complete the following PLANT at their Gas-Works:—
One ROTARY SCRUBBER-WASHER, with Gas-Engine.
One ROTARY EXHAUSTER.
One 5 Brake-Horse-Power GAS-ENGINE.
One Set of ANNULAR CONDENSERS.
One Set of Three PURIFIERS.
Full Particulars can be obtained from Thomas Morgan, Town Clerk, to whom Tenders are to be sent, on or before Monday, the 15th of July, 1901.

BOROUGH OF WALLINGFORD.

**THE Corporation of Wallingford invite** TENDERS for the supply of about 1100 (Eleven Hundred) Tons of GAS COAL, to be delivered at the Works at Wallingford, at such times, and in such quantities as may be directed, between the 1st of August, 1901, and the 31st of July, 1902.
Form of Tender and further Information may be obtained from the undersigned.
Tenders, endorsed "Tender for Coal," to be sent to the undersigned not later than the 13th of July, 1901.
The Corporation do not bind themselves to accept the lowest or any Tender.

FRANCIS E. HEDGES,
Town Clerk.

Town Clerk's Office,
Wallingford, June 26, 1901.

TIPTON GAS-WORKS.

COAL CONTRACTS.

**THE Gas Committee of the Tipton Urban** District Council are prepared to receive TENDERS for the supply of GAS COAL for a period of One Year, to be delivered, carriage free, to their Gas-Works Siding, L. & N.W. Rly., at Tipton.
Specifications and Forms of Tender may be obtained at the Gas-Works, on application to Mr. S. O. Stephenson, the Engineer and Manager.
Tenders to be sent to me, the undersigned, not later than Ten a.m. on Saturday, the 20th of July, 1901, sealed and endorsed "Tender for Gas Coal."
The Committee do not bind themselves to accept the lowest or any Tender.

By order,
JOHN W. WARING,
Clerk to the Council.

Public Offices, Tipton,
June 24, 1901.

TIPTON GAS-WORKS.

TAR CONTRACTS.

**THE Gas Committee of the Tipton Urban** District Council are prepared to receive TENDERS for the purchase of the surplus TAR made at their Gas-Works, for a period of One Year from the 1st day of July, 1901.
The Tar will be delivered free into Contractor's boats on the Canal.
The Purchaser will have to enter into an Agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating Price per Ton for Tar, to be sent to the undersigned on or before the 20th day of July, 1901, endorsed "Tender for Tar."
The Committee do not bind themselves to accept the highest or any Tender.
Further Particulars may be had on application to Mr. S. O. Stephenson, the Engineer and Manager.

By order,
JOHN W. WARING,
Clerk to the Council.

Public Offices, Tipton,
June 24, 1901.

COUNTY BOROUGH OF WEST BROMWICH.
(GAS DEPARTMENT.)

TO COLLIERY PROPRIETORS.

**THE Gas Committee are prepared to** receive TENDERS for the supply of 25,000 Tons of GAS COAL and NUTS for delivery at their Works, Albion, West Bromwich, between Aug. 1, 1901, and June 30, 1902.
The Committee do not bind themselves to accept the lowest or any Tender; and they reserve to themselves the right to divide the Contract between several firms.
Forms of Tender may be obtained upon application to Mr. Thomas Glover, Manager of the Works.
Sealed Tenders, properly endorsed, to be sent to me not later than Saturday, July 13.

By order,
THOS. HUDSON,
Secretary.

Town Hall, West Bromwich,
June 27, 1901.

COUNTY BOROUGH OF STOCKPORT.
(GAS AND ELECTRICITY DEPARTMENT.)

**THE Gas and Electricity Committee** are prepared to receive TENDERS for a supply of CANNEL and COAL for a period of One, Two, or Three Years.
Forms of Tender, Specifications, and Conditions of Contract, together with any further Information, may be obtained from the Engineer, Mr. S. Meunier.
No Form of Tender other than that issued by the Committee will be considered.
Tenders, stating price per Ton delivered at the Railway Station, Stockport, endorsed "Coal," must be addressed to the Chairman of the Gas and Electricity Committee, and sent in on or before Tuesday, July 16, 1901.
The Committee reserve the right to accept for the whole or any portion of the quantity offered, but do not bind themselves to accept the lowest or any Tender.

By order,
ROBERT HYDE,
Town Clerk.

June 28, 1901.

**THE Ruthin Gas Company invite Tenders** for the supply of about 600 Tons of best screened GAS COAL, to be delivered at Ruthin Station in such quantities as may be required by the Company between the 1st day of August, 1901, and June 30, 1902.

Tenders, endorsed "Tenders for Coal," to be sent to me on or before the 5th day of July next.

DAVID JONES,
Secretary.

Ruthin, June 18, 1901.

## TENDERS FOR GAS COAL.

**THE Directors of the Clayton, Allerton,** and Thornton Gas Company invite TENDERS for the supply of 8000 Tons of GAS COAL, screened and unscreened, and 1000 Tons of CANNEL COAL. The Coal to be free from Scale, Sulphurous Pyrites, or other objectionable matter, and to be delivered at the Gas-Works, Low Lane, Clayton, or at the Great Northern Railway Station, Clayton, in such quantities weekly as may be ordered by the Company's Manager, during the next Twelve Months from the 1st of July, 1901. The said Tenders to state the Seam and the Pit from which the Coal is intended to be sent.

Sealed Tenders, endorsed "Tender for Coal or Cannel," addressed to the Chairman, at the Gas-Works, to be delivered at or before Noon on Monday, the 8th day of July, 1901.

The Directors do not pledge themselves to accept the lowest or any Tender; reserving to themselves the right to divide the Contracts as they may think proper.

By order,
JOHN NIVEN,
Secretary and Manager.

Gas Office, Clayton,
Near Bradford, June 18, 1901.

## TENDERS FOR TAR.

**THE Directors of the Clayton, Allerton,** and Thornton Gas Company invite TENDERS for the purchase of the COAL TAR produced at these Works during a period of Twelve Months from the 1st day of July, 1901, to the 30th of June, 1902.

Quantity, about 400 Tons.

The Tar will have to be removed daily from the 1st of October to the end of April.

Sealed Tenders, endorsed "Tender for Tar," addressed to the Chairman, at the Gas-Works, and to be delivered at or before Noon on Monday, the 8th day of July, 1901.

The Directors do not pledge themselves to accept the highest or any Tender.

By order,
JOHN NIVEN,
Secretary and Manager.

Gas Office, Clayton,
Near Bradford, June 18, 1901.

## URBAN DISTRICT COUNCIL OF STOURBRIDGE.

(GAS DEPARTMENT.)

**THE Gas Committee invite Tenders for** the supply and delivery of about 11,000 Tons of GAS COAL.

Form of Tender, &c., may be had on application to the undersigned at the Gas-Works.

Tenders, endorsed "Gas Coal," to be addressed to the Chairman of the Gas Committee, and sent to me at the Gas-Works, before Twelve o'clock on Tuesday, the 16th day of July, 1901.

The lowest or any Tender not necessarily accepted.

By order,
WM. NORTH,
Engineer and Manager.

Stourbridge Gas-Works,
June 24, 1901.

## URBAN DISTRICT COUNCIL OF STOURBRIDGE.

(GAS DEPARTMENT.)

**THE Gas Committee invite Tenders for** the purchase of their surplus TAR for the Year ending June 30, 1902.

Tenders, endorsed "Tar," to be addressed to the Chairman of the Gas Committee, and sent to me at the Gas-Works, on or before Tuesday, July 16, 1901.

The highest or any Tender not necessarily accepted.

By order,
WM. NORTH,
Engineer and Manager.

Stourbridge Gas-Works,
June 24, 1901.

## COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

GENERAL STORES.

**THE Gas Committee invite Tenders for** the supply of the following MATERIAL in such quantities as may be required during the Twelve Months ending the 31st of August, 1902:—

1. Wrought Iron and Steel.
2. Lead Pipe, Block Tin Tubing, Pendants, and Glass.
3. Bolts, Nuts, Rivets, and Washers.
4. Iron Castings, Cast-Iron Pipes, &c.
5. Brass Meter Taps and Keys, and Brass Lamp Taps.
6. Wrought-Iron Steam and Gas Tubing and Sundry Fittings.
7. Gas-Meters.
8. Paints, Red and White Lead.
9. Oils and Tallow.
10. Timber.
11. Rope, Yarn, and Twine.
12. Brushes.
13. Testing and Repairing Weighing-Machines.
14. Brass Fittings for Meters.
15. India-Rubber Rings, Tubing, and Sheeting.

Forms of Tender, and all Information may be obtained, and Samples seen, on application to the Gas Engineer, Gas Office, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Stores," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 11th of July, 1901.

L. C. EVANS,
Town Clerk.

**THE Committee of Visitors of Berkshire** Asylum, Cholsey, near Wallingford, invite OFFERS for the purchase of the whole of the GAS-MAKING PLANT, of about 20,000 cubic feet capacity now standing at the Asylum. The Plant may be inspected on any weekday between the Hours of Ten and Four.

Offers, in writing, must be sent to the above address not later than Wednesday, the 17th of July.

## BARNOLDSWICK URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

**THE Council invite Tenders for the** supply of 2600 Tons of best screened GAS COAL, to be delivered as required at Barnoldswick Station, Midland Railway, during the Year ending June 30, 1902.

The Council may purchase the whole or part of the quantity named.

Also for the supply of 100 Tons of best ENGINE COAL, PEAS, BEANS, or NUTS, to be delivered as required at Foulridge Station, Midland Railway, during the Year ending June 30, 1902.

No Form of Tender supplied.

Tenders to be sent in not later than Wednesday, July 10, 1902, addressed to Mr. Alfred Pilkington, Chairman of the Gas and Water Committee, Town Hall, Barnoldswick, and endorsed "Tender for Coal."

D. E. GARLICK,
Manager.

## WORKSOP GAS COMPANY.

**THE Directors of the Worksop Gas** Company are prepared to receive TENDERS for the supply of 4500 Tons of the best screened GAS COAL and NUTS, to be delivered at Worksop Station, during the Year ending July 31, 1902. To be free as possible from Sulphur, Bats, Bind, Refuse, and Dirt, and shall be weighed (20 cwt. to the ton) upon the Company's Machine.

Tenders to be sent in to the undersigned on or before the 12th of July, 1901.

The Directors reserve to themselves the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

F. KENT,
Manager.

## BOROUGH OF DARWEN.

TENDERS FOR GAS COAL.

**THE Corporation are prepared to re**ceive TENDERS for the supply of GAS COAL for One Year, to be delivered at the Gas-Works Siding, in the Corporation Waggons.

Forms of Tender and all Information as to quantities may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Gas Coal," must be delivered to the undersigned at or before Noon on Thursday, July 11, 1901.

No Tender necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
June 27, 1901.

## NEW MILLS URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL, &c.

**THE New Mills Urban District Council** invite TENDERS for the supply of 1500 Tons of best GAS COAL, and 300 Tons of CANNEL, for the Year ending June 30, 1902.

Form of Tender and full Particulars may be had on application to the Gas Manager.

Tenders to be sent in to me, the undersigned, not later than the 16th of July, 1901.

The Council do not bind themselves to accept the lowest or any Tender.

JOSEPH POLLITT,
Clerk.

Town Hall, New Mills,
June 27, 1901.

## BOROUGH OF HEYWOOD.

**THE Gas Committee invite Tenders for** the supply of

1. COAL AND CANNEL.
2. LIME.
3. TUBES AND FITTINGS.
4. SULPHURIC ACID.

Specification and Form of Tender may be obtained from Mr. W. Whatmough, Gas Manager.

Contractors tendering for this work must pay their Workpeople at least the Standard or Trade Union Rate of Wages, and observe the Trade Conditions which attach to the various kinds of work for which the Tender is sent in.

Sealed and endorsed Tenders to be sent to me not later than Tuesday, July 16, 1901.

By order,
GEORGE G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
June 19, 1901.

## GAS COKE.

**THE Corporation of Halifax are pre**pared to receive TENDERS for the purchase of 1000 Tons of GAS COKE.

Delivery can be made by Railway from the Gas-Works Siding, or by Canal from the Calder and Hebble Navigation Wharf at Halifax.

Form of Tender and full Particulars may be obtained on application to the undersigned.

Sealed Tenders, endorsed "Coke," to be delivered at this Office not later than Ten a.m. on Wednesday, the 10th of July, 1901.

The highest or any Tender will not necessarily be accepted; and the Gas Committee may divide the parcel into smaller lots if they see fit.

THOS. HOLGATE, M.Inst.C.E.,
Gas Engineer.

Corporation Gas-Works,
Mulcture Hall Road, Halifax,
June 29, 1901.

## NORTHWICH GAS COMPANY.

**THE Directors of the Northwich Gas** Company invite TENDERS for the supply and delivery at Northwich Station of about 5000 Tons of GAS COAL during the Year ending June 30, 1902.

Any further Particulars can be had on application to Mr. S. S. Mellor, the Manager.

The lowest or any Tender not necessarily accepted.

Tenders, addressed to the Chairman, must be delivered here not later than July 5.

HENRY PICKERING,
Secretary.

Northwich, June 22, 1901.

## LITTLEHAMPTON GAS COMPANY, LIMITED.

TENDERS FOR COAL.

**THE Directors of the above Company are** prepared to receive TENDERS for the supply of about 3500 Tons of GAS COAL, to be delivered during the Year ending June 30, 1902.

Particulars and Forms of Tender may be obtained from A. W. Elton, Engineer and Manager; and Tenders must be delivered on or before July 10 next to the undersigned, endorsed "Tender for Coal."

W. BELDAM,
Secretary.

Gas Office, Littlehampton.

**THE Portishead Gas Company, Limited,** invite TENDERS for supplying 800 Tons of GAS COAL, to be delivered at the Portishead Dock (by Water) or at their Siding (by Rail), at such times and in such quantities as may be required by the Manager.

An Analysis of the Coal must be enclosed with the Tender.

Sealed Tenders, endorsed "Tenders for Gas Coal," and addressed to the Chairman of the Company, must reach me not later than July 6.

The Company do not bind themselves to accept the lowest or any Tender.

A. W. STONE,
Manager.

Gas-Works, Portishead, Somerset,
June 22, 1901.

## SAFFRON WALDEN UNION.

TENDERS FOR COAL.

**THE Guardians of the above Union are** prepared to receive TENDERS for the supply of about 175 Tons of best Hand-Picked Hard STEAM COAL for Six Months from the 15th prox.

Sealed Tenders, endorsed "Tender for Coal," to be sent to me, the undersigned, not later than Monday, the 8th prox.

The lowest Tender will not necessarily be accepted.

By order,
TURNER COLLIN,
Clerk.

Saffron Walden,
June 27, 1901.

## URBAN DISTRICT COUNCIL BOROUGH OF NEWRY.

TENDERS FOR GAS COAL.

**THE Gas Committee of the above** Council invite TENDERS for the supply of from 3000 to 3500 Tons of best screened GAS COAL for a period of Twelve Months, to be delivered in such quantities and at such times as may be required by the Committee, and to weigh 20 cwt. to the ton over the Gas Committee's Weighbridge at their Works (said Machine regularly inspected by officer under "Weights and Measures Act"), and delivered *free ex* Ship or Steamer at Albert Basin, Newry.

The Coal to be Fresh Wrought, Dry, and Free from Hards, Smudge, Dirt, Shale, Pyrites, or other objectionable Matter for Gas Making.

Further Particulars may be obtained from Mr. A. Gibb, Manager.

Sealed Tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, and where raised, to be addressed to John H. Small, Esq., Chairman, and delivered to the undersigned not later than Eleven a.m., on Friday, the 12th of July.

The Committee reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender. They also reserve the power to decline acceptance of any Coal *not equal in their belief* to that contracted for.

By order,
THOMAS WATT,
Secretary for Gas Committee.

Gas-Works Office, Newry,
June 29, 1901.

## SALE OF GAS STOCK.

**THE Hastings and St. Leonards Gas** Company, pursuant to their Acts of 1883 and 1899, invite TENDERS for 3½ per cent. CONVERTED STOCK, in multiples of £10, sufficient to raise, with Premiums on issue, £24,201 17s.—the balance of the Ordinary Capital authorized by the Company's Act of 1883—to be sent to Mr. A. E. Young, Bank Buildings, Hastings, the Secretary of the Company, on or before the 31st of July next.

This Stock, under the Sliding-Scale Clauses, and at the present price of Gas charged to the Consumers, is entitled to an additional 1½ per cent.; thus making it at the present prices equivalent to a 5 per cent. Stock.

The whole amount payable, including Premium, will have to be paid to the Company's Account at the London and County Bank, 21, Lombard Street, E.C., or at the Hastings Branch, on or before the 31st day of August next; and the new Issue will be entitled to its first Dividend from that date to the 31st of December, 1901, after the declaration of Dividend in March next.

No Tenders under par will be accepted.

Tenders may be made for any amount of Stock in multiples of £10, and two or more different Tenders at different prices may be sent in by any Applicant.

Forms of Tender and any further Particulars may be had of the Secretary.

A. E. YOUNG,
Secretary to the Hastings and St. Leonards Gas Company.

Bank Buildings, Hastings.

TENDERS FOR GAS COAL.

**THE Gas Committee of Limerick invite** TENDERS for 8000 or 17,000 Tons of GAS COAL, according to Specification to be had on application at the GAS OFFICES, 34 & 35, William Street, LIMERICK.

ROTHERHAM CORPORATION.

COAL CONTRACTS.

**THE Gas Committee invite Tenders for** the supply and delivery at the Gas-Works, Frederick Street, Rotherham, from the 1st of October next, of 16,000 Tons of best screened GAS COAL.

Form of Tender may be obtained upon application to the Secretary at the Gas-Works.

Sealed Tenders to be sent to me not later than the 6th of July next, endorsed "Tender for Coal."

By order,
H. HAMPTON COPNALL,
Town Clerk.

Council Hall, Rotherham,
June 21, 1901.

URBAN DISTRICT OF SKIPTON.
(GAS DEPARTMENT.)

TAR.

**THE Council invite Tenders for the** purchase and removal of the surplus TAR produced at the Skipton Gas-Works, between July 1, 1901, and June 30, 1902.

Probable quantity, 400 Tons.

Further Particulars may be obtained from Mr. J. H. Woodward, Gas-Works, Skipton, to whom Tenders, endorsed "Tar," are to be sent before Saturday, July 6, 1901.

RICHARD WILSON,
Clerk to the Council.

June 25, 1901.

BOROUGH OF ILKESTON.

**THE Gas Committee are open to con** sider TENDERS for the supply and delivery of from 8000 to 8500 Tons of GAS COAL or NUTS.

Sealed and endorsed Tenders to be delivered to Wright Lissett, Esq., Town Clerk, Ilkeston, before July 12 next.

The Committee do not pledge themselves to accept the lowest or any Tender; and reserve their right to divide up the quantities offered.

Forms of Tender and any further Particulars may be had of

F. C. HUMPHRYS,
Engineer and Manager.

Gas-Works, Ilkeston,
June 24, 1901.

NEWCASTLE AND GATESHEAD WATER COMPANY.

**TO BE SOLD by Auction, in the Board-** Room of the Company's Offices, Pilgrim Street Newcastle-on-Tyne, on Tuesday, the 16th of July, 1901, at Half-past Twelve o'clock precisely, by Mr. Charles A. Joel, in such Lots as are provided for in the Company's Act of 1894—

FIFTY THOUSAND POUNDS OF FIVE PER CENT. PREFERENCE STOCK (1894).

Printed Particulars and Conditions of Sale may be had at the Company's Offices; and Messrs. George Armstrong and Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 66, New Bridge Street, Newcastle-on-Tyne.

GEORGE SMITH,
Secretary and General Manager.

Newcastle-on-Tyne,
June 11, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MR. ALFRED RICHARDS begs to** notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ROMFORD GAS AND COKE COMPANY, LIMITED.

600 £5 FULLY-PAID "B" SHARES.

**MR. ALFRED RICHARDS will Sell the** ABOVE BY AUCTION, at the Mart, E.C., on Monday, July 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BOURNEMOUTH GAS AND WATER COMPANY.

174 £10 "B" SHARES.

**MR. ALFRED RICHARDS will Sell the** ABOVE BY AUCTION, at the Mart, E.C., on Monday, July 15, at Seven o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
KINGSTON-UPON-THAMES GAS COMPANY.

£5800 FOUR PER CENT. DEBENTURE STOCK.

**MR. ALFRED RICHARDS will Sell the** ABOVE BY AUCTION, at the Mart, E.C., on Monday, July 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

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## GAS COMPANIES' BOOK-KEEPING.

**A Practical Treatise on the Keeping of Gas Companies' Accounts.**

BY

**JOHN HENRY BREARLEY & BENJAMIN TAYLOR,**
OF LONGWOOD.

No pains have been spared by the Authors to make this book complete in every respect. The system of accounts recommended is not only a model of clearness, but also fully adequate to meet all reasonable requirements. Generally, the get-up of the book and of the various forms and specimen rulings shown therein is excellent. The work will be found both useful and reliable, while its convenience is greatly enhanced by the inclusion of an adequate index.—*The Accountant.*

Should be a useful work for Gas Companies. The work seems to us a model of exactness, simplicity, and clearness.—*Halifax Courier.*

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

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**Above the Average in Weight and Quality of Coke.**
**Maintains a High Standard in Residuals.**

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## HYDRAULIC BLOWER

**For blowing Air into Gas Purifiers for the purpose of**

## REVIVIFYING THE FOULED OXIDE.

Full Particulars on application.

**LUXWERKE LUDWIGSHAFEN AM RHEIN.**

## NEWBATTLE CANNEL.

**Highest Results in Gas, & Excellent Coke.**

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NEWBATTLE COLLIERIES,
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**Head Office: Miles Platting, MANCHESTER.**

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Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 Inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

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| Coke . . . . . | 66·7 | Coke. |
| Sulphur . . . . . | 0·86 | Sulphur. |
| Ash . . . . . | 2·04 | Ash. |

As per Analysis by
Mr. JOHN PATTINSON, F.I.C., F.C.S.

For Prices, &c., apply to
**W. H. PARKINSON,**
**THE HARTON COAL CO., LTD.,**
**NEWCASTLE-ON-TYNE.**

Telegraphic Address: "PARKINSON, NEWCASTLE."

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**STEEL OF ALL DESCRIPTIONS.**
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
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**90, CANNON STREET, E.C.**

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The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.

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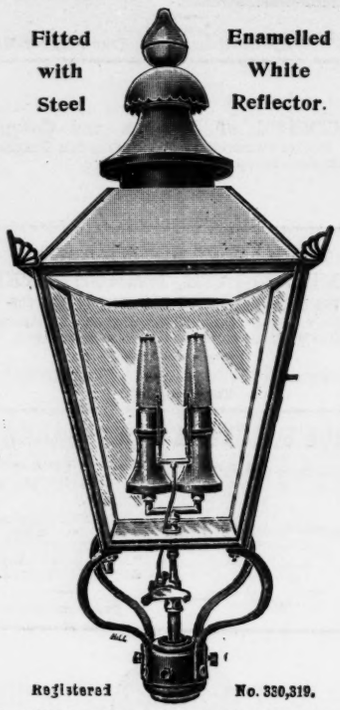
THE
## "KILBURN" LANTERN.

Fitted with Steel

Enamelled White Reflector.



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The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.

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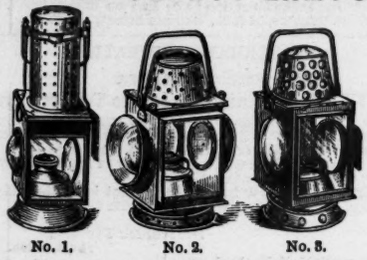
## CANDLE SAFETY LAMPS.



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## CANNEL & COAL.

TYNE
## BOGHEAD CANNEL.

| | |
|---|---|
| Yield of Gas per ton | 13,155 cub. ft. |
| Illuminating Power | 38·22 candles. |
| Coke per ton | 1,301·88 lbs. |

## EAST PONTOP GAS COAL.

| | |
|---|---|
| Yield of Gas per ton | 10,500 cub. ft. |
| Illuminating Power | 17·8 candles. |
| Coke | 70 per cent. |

## SOUTH PELAW MAIN GAS COAL.

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| Yield of Gas per ton | 10,500 cub. ft. |
| Illuminating Power | 16·3 candles. |
| Coke | 73·1 per cent. |

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THE "DE BROUWER"
# PATENT COKE-CONVEYOR

THESE CONVEYORS ARE NOW WORKING IN ENGLAND
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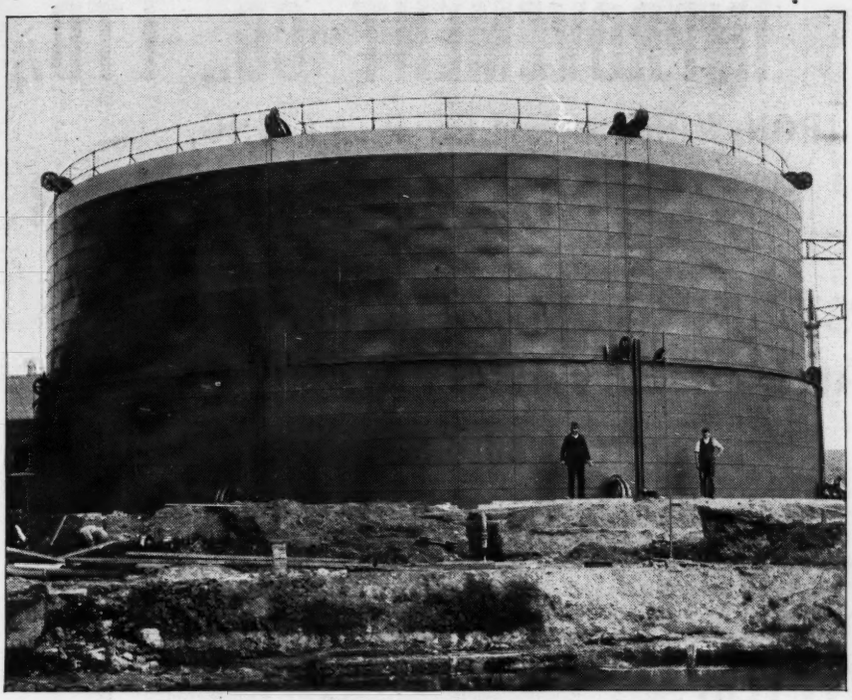
**Guaranteed by Sole Makers:**

# W. J. JENKINS & CO., Ltd., RETFORD.



Two-Lift Cable-Guided Gasholder, 80 ft. diameter by 20 ft. deep.
STAFFORD CORPORATION GAS-WORKS. (*From a Photo.*)

**COPY OF TESTIMONIAL.**

CORPORATION OF STAFFORD,
GAS & ELECTRICITY DEPARTMENT,
STAFFORD, *Feb.* 9, 1899.

Messrs:
ASHMORE, BENSON, PEASE, & CO., LTD.,
Stockton-on-Tees.

GENTLEMEN,

It affords me pleasure to state that our No. 2 Gasholder, from which you removed the outside Guide-Framing on account of it being defective due to the settlement of the foundations, and substituted your Steel-Wire Cable System for both Inner and Outer Lifts, has, since the alteration, **worked perfectly satisfactory.**

Its Stability and Rigidity under High Wind Pressures, when fully inflated, is such that it **preserves the level working of both Lifts, and gives a steady outlet pressure.**

I am, sincerely yours,
JNO. FERGUSON BELL,
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**Analysis: 12,600 Feet of 19-Candle Gas per Ton.**

**Value in Pounds of Sperm, 820·80.**

**VERY FREE FROM IMPURITIES.**

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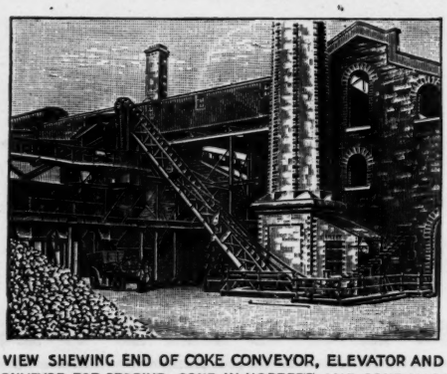
## WEST'S STOKING MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

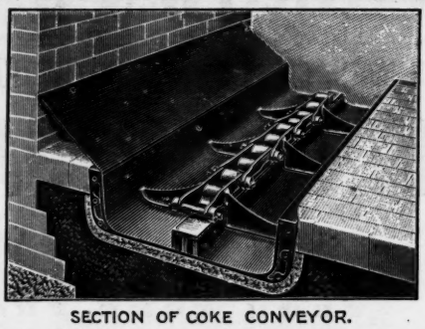
ALSO

**WEST'S PATENT SILENT COKE CONVEYOR**



VIEW SHEWING END OF COKE CONVEYOR, ELEVATOR AND CONVEYOR FOR STORING COKE IN HOPPERS AND COKE YARD.

INTERIOR OF RETORT HOUSE SHEWING COKE CONVEYOR.



SECTION OF COKE CONVEYOR.

**Silent in Action. Simple Wearing Parts. Does not make Breeze.**

SPECIALLY ADAPTED FOR CONVEYING, ELEVATING, AND STACKING HOT COKE FROM GAS-RETORTS OR COKE-OVENS.

The Conveyor after leaving the Retort-House may be arranged to rise up an incline to any required height, and the Coke delivered from the Conveyor to the Coke-Store from any part of the Conveyor.

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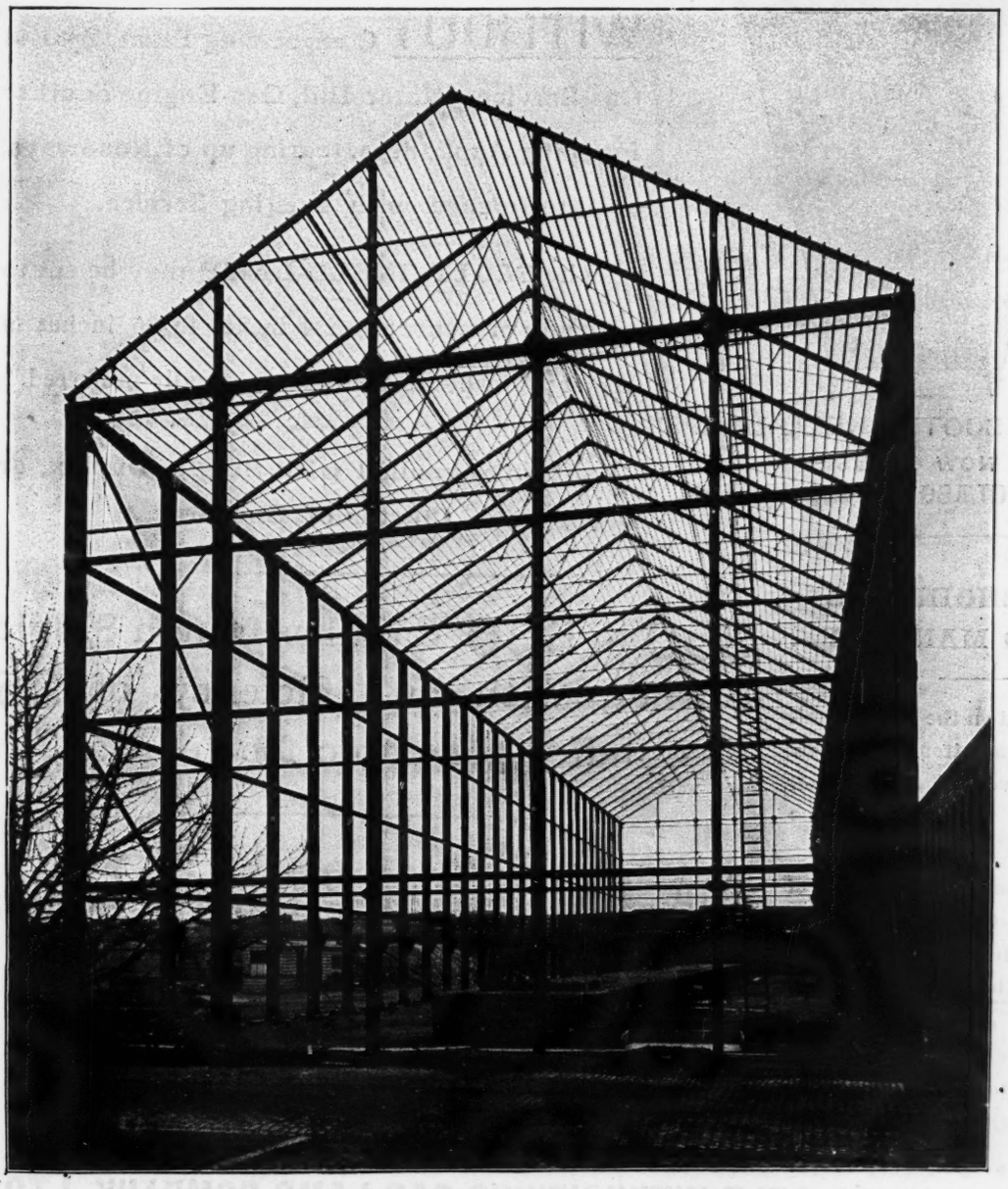

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# SELF-INTENSIFYING LAMP.

**Automatic Action.**

**No Complex Mechanism.**

**"Power" Free of Cost.**

TYPE OF SCOTT-SNELL LAMPS
NOW IN USE
AT THE GLASGOW EXHIBITION.

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**WITHOUT** Compressing Plant, Special Gas-Service, Water Bill, Gas-Engine or other Pumping Appliances, tearing up of Roadways, or interference with existing Service.

The **SCOTT-SNELL LAMP** may be set to give any pressure from **4 inches to 36 inches of Water; 8 inches to 10 inches is usually preferred.**

**Lanterns supplied with Single, Duplex, or Cluster of Burners.**

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**At the Stand on the North Bank of the Kelvin, an attendant will be pleased to give full explanation, and to show the action of the Lamp.**

**This unique Illustration of Wasted Bye-Products (heat in escaping products of combustion) effecting, without cost, all that is elsewhere reached by special motive power and special distributing Mains, should not be missed,**

350 to 500 Candles from a Single Burner, with an efficiency of 35 Candles per cubic foot of Gas.

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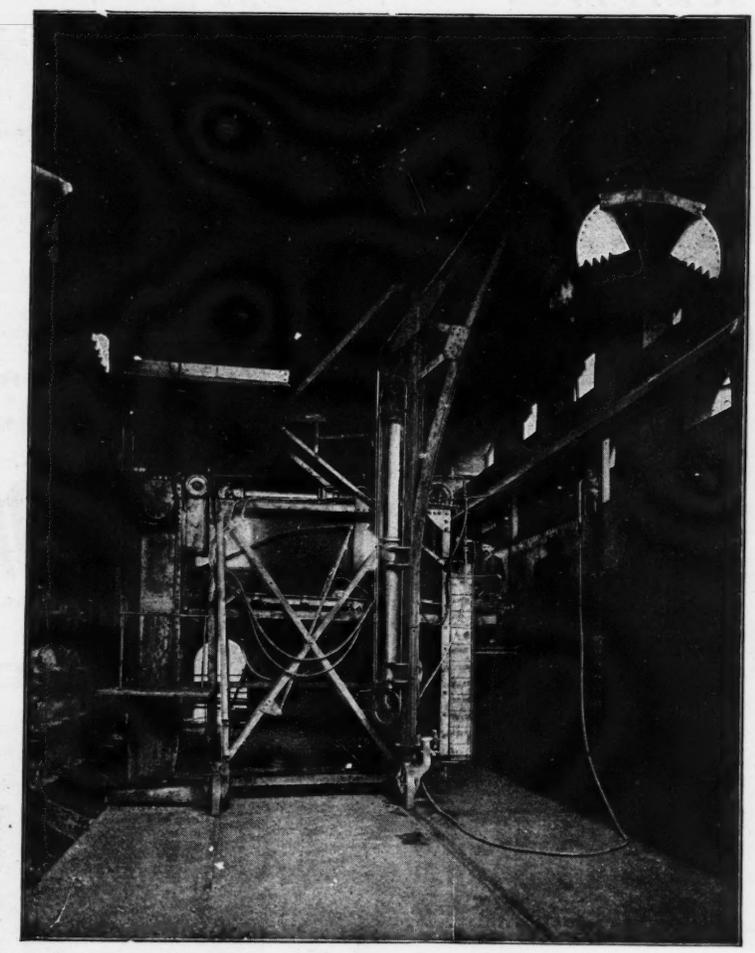

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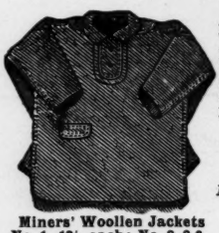

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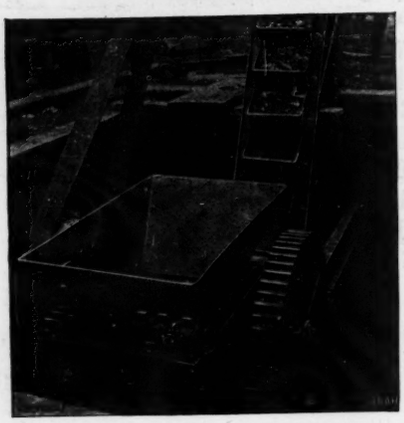

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PHOTO, SHOWING ELEVATOR FOR COLD COKE.

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